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Treatment by die

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1 health ② diet therapy

③ diseases.

4. food allergy.

5. routine hospital diets

6. dietary management

TREATMENT BY DIET

BY

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CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE, * MYSORE. *
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FIFTH EDITION

14 Plates, Including 13 in Color

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Treatment by die...

PRINTED IN THE UNITED STATES OF AMERICA

TO

MY WIFE

BESSIE LONG BARBORKA

Preface to the Fifth Edition

Intelligent treatment by diet is the greatest weapon available to preventive medicine. Owing to the tremendous advances in the field of nutrition since the Fourth Edition of this work it has been necessary to rewrite, revise and expand more than half the book. The importance of vitamins in nutrition should not need any emphasis. The constructive criticism that has curbed the overenthusiasm which resulted in the public's indiscriminate use of vitamins has caused the pendulum to swing back to the physician for specific and discriminating use.

The new knowledge of protein and amino acids in diet therapy has raised an appreciation of their special value as prophylactic and therapeutic agents of great interest to the medical profession. This aspect of protein usage is increasing very rapidly and a new chapter has been written to give full coverage to the therapeutic use of protein and amino acids.

The discovery and synthesis of the vitamin folic acid (L. casei factor), which is effective in cases of pernicious anemia, sprue, macrocytic anemia of pregnancy and other forms of macrocytic nutritional anemias in a manner similar to that caused by liver extract when given orally or parenterally, give encouragement to the belief that these relationships will soon be clarified and that the nature of the anti-pernicious-anemia principle itself will be discovered.

Many new charts have been supplied which cover the fat- and water-soluble vitamins and give their function in the body, clinical features of deficiency or absences, their relative distribution in a few common foods, and indicate recommended daily allowances and therapeutic dosage.

We have proposed five methods of diagnostic aid in determining deficiency states. We have drawn up numerous tables to afford quick aid in differential diagnosis of deficiency states and in determining factors that may interfere with digestion, absorption or utilization of food ingested.

A new chapter has been supplied on deficiency diseases incorporating the newer concepts of nutrition and deficiency states. This chapter includes macrocytic anemias and hypochromic, microcytic anemias with many colored photographs demonstrating physical signs in patients with deficiency disease about the tongue, eyes and mouth.

The chapter on liver disease has been rewritten to incorporate the newer conception of the application of protein and to bring up to date the use of choline and other food factors utilized in treating cirrhosis of the liver, chronic hepatic diseases and hepatocellular jaundice.

In the chapter on diabetes mellitus we have taken out all the diets restricting carbohydrates below 100 grams and have added or reorganized our series of diets for diabetes to allow up to 250 grams of carbohydrate. We have written a new chapter on diet and skin diseases and on preoperative and postoperative dietary care; have added tables, taking advantage of shorter methods of calculation as well as long tables of 100-gram portions of foodstuffs, incorporating vitamins, minerals, etc.

A series of new colored plates has been added to demonstrate and to aid in the visualized teaching of comparative servings of all the types of food recommended by the Food and Nutrition Board of the National Research Council.

The magnitude of the literature on nutrition today makes it well-nigh impossible for clinicians and others to keep abreast of the field. We cannot hope to have done more than approximate justice to all the publications or to have avoided entirely errors of judgment in selection and interpretation of the available literature. We have purposely omitted excessive details and lengthy accounts of theories. We have attempted to maintain the original purpose of this book, namely, to give physicians a simple, crystallized, practical and workable method of prescribing diets and applying treatment by diet to health and diseases. We shall appreciate constructive criticism or comments that will improve the efficiency or practical usefulness of this book.

The author appreciates the tireless, devoted and efficient efforts of his secretary Nona Pillar, and his son, Clifford J. Barborka, Jr., who typed all of the manuscript. To our publishers, J. B. Lippincott Company, we wish to express our deep gratitude for their patience, forbearance, counsel and aid.

CLIFFORD J. BARBORKA

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Chicago, Illinois

Preface to the First Edition

The purpose of this book is first, to present to physicians a concise, practical and systematic method of prescribing diets and applying treatment by diet to health and disease; second, to aid the physician and dietitian in teaching the individual patient how to make a selection of the proper amount and type of food that has been prescribed for him. The chapter on "The Application of Diet Therapy" offers an excellent method of teaching the patient to visualize definite portions and servings of the various foodstuffs.

Almost every physician has a different method and conception of treatment by diet. Most of these are variations of existing plans and stock diet lists of greater or less antiquity and do not consider the individual patient's needs. Many are fairly complex with the result that the patient, and at times even his medical advisor, are both needlessly confused. There is a great deal of scientific material of considerable value regarding diet being written and given out to the public; however, there is, also, so much unscientific and faddish information being disseminated that it is very difficult for the physician to teach his patients the proper conception of the relation of diet to health and disease.

Because of the above facts the writer has placed stress upon the elementary principles that science has developed. He has purposely omitted excessive details and lengthy accounts of theories. Through his observation and contact with other physicians in the practice of medicine and by an extensive review of the literature, including the many excellent scientific and detailed texts on the subject of nutrition, he has incorporated the most widely accepted ideas of other men in the various fields of nutrition.

Furthermore, the material presented in this book has proved to the writer to be an effectual measure, in applying treatment by diet, in both hospital and private practice.

The author is under obligation to various friends and co-workers both during the years spent at the Mayo Clinic and the present facilities afforded by the Northwestern University Medical School. Particularly does he wish to acknowledge the valuable aid and criticism of his dietitian, Miss Pearl Lewis.

Clifford J. Barborka

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PART I

DIET IN HEALTH

Diet in Health

- EVOLUTION OF OUR DIET
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- ADEQUATE PROTEIN
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We have been engrossed so long in perfecting machines that we have almost forgotten the nameless and the indispensable force behind them—man. We have studied the nutritional needs of our domestic animals; we have replanted our forests and dust bowls; we have built dams and irrigation ditches; but only very recently have we begun to be aware that there is such a thing as human erosion. We have taken the human being for granted. We have worked more or less on the old theory that what was good enough for grandfather was good enough for us, forgetting that the soil and the foods in grandfather's day and the conditions of that civilization differed tremendously from those of the mechanized civilization of today. Sadly enough, not until war involved a rich and a wasteful land did the nutrition of mankind become a matter of national policy.

EVOLUTION OF OUR DIET

When one delves into the study of man he emerges with the feeling that there have been very definite epochs in the evolution of our diet. Races of people have changed very definitely and radically their habits of eating by some unforeseen circumstance. Custom determines the arrangement of the meal and the kinds of foods eaten, but the experience of the race governs the custom. In reflecting upon the food habits of our ancestors, one may feel that they derived adequate nourishment without knowing the scientific facts of nutrition, such as the ash content of the orange, the caloric value of bacon and eggs or the vitamin property of tomatoes. This, perhaps, is true, but great changes have taken place in the past thirty years in the production and the selection of food. The assumption is expressed often that the normal person, when free to choose, will by instinct select the foods best suited to his needs. Within definite limits this may be true, but, generally speaking, the question is not so much what he will select as what by economic force and necessity he can get for sufficient nourishment. There is a great diversity of diet upon which people in various parts of the world subsist, and upon which they manage to do fairly well. The American diet contains a large proportion of concentrated foods, low in vitamin, in residue and in alkaline minerals, and high in carbohydrate and in acid minerals. The tendency has run to an inadequate amount of the bulky residue-containing foods, such as fruits and vegetables. As a result of propaganda with regard to fruits and vegetables, the pendulum is probably now swinging in the opposite direction.

The term protective foods has been applied to meat, milk, eggs, fruits and leafy vegetables. The greater use of protective foods is becoming more widespread every day, and milk, fresh meats, eggs, fruits and vegetables are available in the smallest places throughout the year. A diet such as the average one containing a high percentage of nonprotective foods is conducive to early degenerative diseases. Not only this, but diet each day shows its immediate influence on the emotions and the natures of individuals, and indications point to the fact that years, or even generations, of certain racial habits of an inadequate or unbalanced food intake, though very slight and even disregarded by the casual observer, may affect the mass characteristics and physical build of certain races.

FOOD AS A SOCIAL FACTOR

A large majority of adult patients who consult the average physician are very interested in diets. Journals, bookshelves, newspapers and radio broadcasts are overflowing with information about diets. Some of this information is worth while and some is not. There is no field of human thought in which sentiment and prejudice so completely take the place of sound judgment and logical thinking as in dietetics. Within the last few years our scientific knowledge of vitamin content, mineral elements and other constituents of food has increased tremendously. Our newer knowledge of nutrition is recognized today as of great importance in relation to health and to disease. The application of this knowledge to the treatment of disease is becoming more inclusive each year, and diet therapy is found to be an important factor in the treatment of many diseases with which previously it had not been associated. Food is being recognized as a most important social factor in the life of every human being. Events are occurring today that indicate how international relationships are affected by our universal dependence upon the adequate supply and distribution of food.

Medical treatment is resolving itself more and more into modifications of food ingested. As a matter of fact, the abundance or the dearth of food, its cost and its distribution affect indirectly, but intimately, the therapy of every patient. In order to formulate proper diets in the treatment of disease, it is first necessary to have a comprehensive grasp of the nutritive principles of diet in health. All the newer knowledge of the nutritive needs of the human body is the result of experimental studies on animals, correlated with the application of these studies to human subjects.

PROBLEMS IN SECURING ADEQUATE NUTRITION

There are many problems to be faced in putting nutrition knowledge to work in the United States. Not the least of these results from low incomes. Many families just do not have enough cash income to buy the right kind of food, and they may not live where they can earn this; or even if they should earn an income sufficient to meet the cost of the adequate amount of food, it is a truly major problem to educate these people as to the proper intake and the proper expenditure for it. We are obligated as physicians to stimulate every patient to realize his own potential optimum health and well-being and to strive to attain it by every means at his command. We must inform every patient of the simplest facts concerning food values, so that he may know how to select the right food. There are pitfalls and dangers in any nutrition program: some people will always exploit nutrition propaganda for personal gain; others will listen to quacks and charlatans; and still others will take a distorted view, either overemphasizing certain phases or discounting the whole program and taking pleasure in expanding their ideas and ridiculing constructive efforts. Then there are those who become so enthusiastic about the potential benefits of synthetic vitamins that they have little faith in the protective foods and well-planned meals. They may spend money unwisely on vitamin concentrates when the same money spent for good food might benefit them and their families far more. In any surge of interest in a new movement there are these dangers, but, fortunately, the pendulum eventually swings back to the middle of the road. Interest in nutrition is spreading, and it is the duty of those who are informed to convince the uninformed that the knowledge of nutrition is worth having and applying practically. Good nutrition for an individual implies that he receive and utilize a suitable metabolic mixture of all substances necessary for health. This can be obtained only from foods selected, processed, prepared, consumed, absorbed and utilized so as to furnish in optimal amounts the individual's essential nutrients. The optimum allowance which is recommended for each nutrient should be much greater than the minimum requirement of that nutrient; that is, provision must be made not only for actual requirements but also for variations from the normal both in health and in disease, for the accumulation of some reserves and for differences in actual food intake due to food habits, individual taste and variation in economic status. Such a diet must contain certain essential requirements in order adequately to protect and maintain health. These requirements are: (1) Adequate protein; (2) mineral elements; (3) vitamins; (4) sufficient calories for energy requirements; and (5) water.

ADEQUATE PROTEIN

The ingestion of food usually is considered to satisfy two physiologic requirements: first, to furnish raw materials for the growth and the repair of body tissues; second, to furnish energy for the processes of life. Protein alone furnishes the raw material for the growth and the repair of body tissues during infancy and youth. In the adult, protein is no longer needed for the growth, but the processes of repair must continue in order to provide the maintenance of normal weight and function.

Proteins are the principal nitrogenous constituents of all plant and animal tissues. They are essential constituents of both the protoplasm and the nucleus of cells, and they are the main organic constituents of the muscle and the glandular tissues of the body. They are important in the osmotic relations between intracellular and extracellular fluid. The individual structure and the function of the body tissues depend to a large extent on the presence of specific proteins, such as the enzymes, the hormones and the antibodies. Chemically, proteins are large complex, organic molecules consisting of amino acids linked together. In the process of digestion these large molecules are broken down to simpler, chemical units (polypeptides), and ultimately into the component amino acids which are still smaller molecules. The amino acids are then absorbed, enter the portal blood on absorption from the intestine and are distributed to the tissues by the systemic blood. After a meal rich in protein there is a temporary rise in the blood amino-acid concentration. Depending on the state of the individual's nutrition, a part of the absorbed amino acids is used to replace and build body and plasma protein. The remainder is deaminated, chiefly by the liver, with the formation of carbohydrate and the production of nonprotein nitrogenous products, which are excreted in the urine. Therefore, the urine nitrogen represents the sum of that derived from body protein breakdown (endogenous) and that derived from the food protein used for energy and not for building body tissues (exogenous). About half the amino-acid molecules after deaminization are changed to carbohydrates. Plasma proteins are of at least two distinct varieties: the albumins and the globulins, separated chiefly by the former's greater solubility in water. The globulin fractions are fibrinogen and the alpha, the beta and the gamma globulins. Each fraction has certain characteristic physical properties and is associated usually with specific physiologic function. For example, circulating antibodies are found chiefly in the gamma globulin fraction, whereas prothrombin, essentially for the clotting of blood, is found chiefly in the beta globulin fraction. The globulin fractions usually exert less than one fifth of the osmotic effect of albumin, and it is not usual for the globulin fractions to be changed significantly with changes in protein nutrition. The albumin is the plasma protein which first becomes reduced in protein deficiency. Likewise in plasma protein loss, such as into exudates from burn surfaces, or into the urine, as in nephrosis, it is the albumin which is most affected. Thus, severe depletion of body protein may eventually be reflected in the blood by a fall in the plasma albumin concentration. However, it should be emphasized that a measurable fall in the plasma albumin concentration occurs only after a pronounced loss in body proteins. When a low blood albumin concentration develops, body protein depletion must be suspected. The critical level of plasma albumin below which edema usually occurs is about 3 per cent. Certain situations—as, for example, anemia—may modify this critical level, for it is well known that edema may occur with plasma albumin levels greater than 3 per cent. The plasma proteins are manufactured largely in the liver, especially by fibrinogen and albumin. The globulins may be synthesized, at least in part, by the reticulo-endothelial system.

AMINO ACIDS

Amino acids are to protein what glucose is to starch. In other words, they are the unit components of food and tissue proteins. The isolation from food of these specific chemical components which enter into the metabolic activities of the body represents the most important recent contribution of chemistry to the field of nutrition. Amino acids differ from vitamins in that they are more than catalysts or enzymes; they actually enter into the structure of body tissue. Consideration, therefore, of the amino acids as the structural units of food proteins leads immediately to an enumeration of these various amino acids listed in Table 1. Some twenty-two nutritionally important amino acids have been identified. Recent research has shown that at least eight are necessary for the maintenance of nitrogen equilibrium in young human adults for limited periods. The term essential as applied to an amino acid means that body tissues cannot make that amino acid in sufficient amount to meet physiologic requirements; therefore, it must be obtained ready-made from food. It also means that the amino acid in question is necessary for some essential physiologic process. Practically nothing is known of the quantitative requirements of each of the essential amino acids in man. The biologic or nutritional value of proteins is dependent on their content of amino acids, particularly those that are essential. Generally speaking, proteins of animal origin, which include not only those in meat, both from muscle and glandular tissue, but also those in milk, eggs, fowl and fish, are of higher nutritional value than the commonly used vegetable proteins, since they are complete. That is, they contain all the essential amino acids. However, vegetable proteins supply many of the essential amino acids, and in properly selected diets they may supplement one another and result in the ingestion of adequate protein.

TABLE 1

Classification of Amino Acids with Regard to Their Growth Effects

ESSENTIAL	NONESSENTIAL
*Arginine	Alanine
Histidine	Aspartic Acid
Isoleucine	Citrulline
Leucine	Cystine
Lysine	Glutamic Acid
Methionine	Glycine
Phenylalanine	Hydroxyglutamic Acid
Threonine	Norleucine
Tryptophan	Proline
Valine	Serine
	Tyrosine

* Arginine can be synthesized by the animal organism, but not at a sufficiently rapid rate to meet the demands of normal growth.

When the proteins are broken down and metabolized, most of the amino acids furnish the organism with both glucose and fatty acids. For purpose of calculation we usually assume that for every 100 Gm. of protein metabolized the body is furnished with about 58 Gm. of glucose and 44 Gm. of fatty acids. Protein contains about 16 per cent nitrogen; therefore, each gram of nitrogen represents 6.25 Gm. of protein metabolized. When protein is metabolized in the body, its nitrogen is fairly promptly eliminated in the urine. About 10 per cent of the nitrogen of food is eliminated in the feces. We can estimate the protein metabolism during twenty-four hours by adding urine nitrogen and feces nitrogen and multiplying by 6.25.

An individual is considered to be in nitrogen equilibrium when the nitrogen intake is equal to the nitrogen excretion over a period of several days. Nitrogen intake is derived from ingested foods, though recently proteins and their hydrolysates have been given parenterally.

One of the most confusing problems of nutrition both in health and in disease is the question as to what is the adequate protein of the diet. Before the rationing of food in World War II it was not uncommon for persons to consume 150 Gm. of protein, chiefly of animal origin, per day. Soldiers and those doing heavy physical labor generally prefer large quantities of meat, partly because of its satiety value, and also because meat furnishes fat and hence contributes effectively to energy. The amount of protein in the diet in the United States, as well as relative proportions of animal and vegetable protein, varies considerably. For some time physicians, following Sherman's careful work, have recommended approximately 1 Gm. of protein per Kg. of body weight for optimum nutrition in the normal adult, with increases of from half to twice as much in pregnancy, in lactation and in growth, and even more in certain pathologic states, such as extensive burns, various diseases in which there is loss of protein or poor synthesis of protein. It is evident that protein has many necessary functions in health and in the field of preventive and curative medicine. Many of these are discussed in the chapter on protein in diet therapy. Much experimental work has been done and individual conclusions have been drawn. One of the first attempts to test the desirable level of protein in the diet, by the statistical approach, was made by Voit. In the study of the diets of the average laborer in Germany, a daily consumption of 118 Gm. of protein was observed. So great was the prestige of Voit that this standard allowance of dietary protein was accepted without serious challenge for a quarter of a century.

Chittenden of Yale and Hindhede of Copenhagen in the early part of the present century held that the Voit standard diet supplied an excessive amount of protein and that a lower level was desirable. Chittenden concluded, after extensive experiments on himself and a variety of individuals, that a low protein diet, approximately 50 Gm., was adequate for an adult of normal weight. A great many clinicians still incline toward a low protein ration in disease. Hindhede, the Danish physiologist, has published results favorable to an even lower protein dietary than Chittenden's, the protein content of his diet to be made up chiefly of bread, potato and fruit. In contrast with the very low protein diet is Stefansson's experience in the Arctic Circle. For nine years he lived on a strictly carnivorous diet without any ill effects. DuBois has reported experiments with people living on a carnivorous diet without ill effects. He also found in surveying his old records that he has given as much as 94 Gm. of protein to all sorts of patients without paying attention to size. Wu and Wu found that the Chinese dietaries have an average protein intake of approximately 92 Gm. However, a larger amount of this protein is vegetable rather than animal. Krogh in his studies gave as much as 234 Gm. of protein per day. Sherman, from experiments on a large series of humans, felt that, calculating on the basis of a 70 Kg. subject, the average intake of 42 Gm. of protein per day or about 0.6 Gm. per Kg. of body weight maintained nitrogen equilibrium. In some instances the intake of protein fell to 30 Gm. of protein a day on a basis of 70 Kg. of body weight. Sherman's view is that the minimum requirement for a man of 70 Kg. is 44 Gm., but to allow for a margin of safety of 50 per cent, about 70 Gm. or 1 Gm. per Kg. should be taken.

Sherman concluded, therefore, after a careful consideration of the acceptable balance experiments with human beings, in which nitrogen equilibrium was established at low levels of dietary protein, that a standard allowance of 1 Gm. of protein per Kg. of body weight per day appeared to provide a margin of safety of from 50 to 100 per cent as far as requirement of adult maintenance was concerned. This standard for adult maintenance has been accepted almost universally.

While the need for larger amounts of protein in diets of growing children and of pregnant and lactating women is clearly recognized, the recently adopted standards for national nutrition, as proposed by the Food and Nutrition Board of the National Research Council, provides for 70 Gm. of protein per day in the diet of a man weighing 70 kilos and 60 Gm. of dietary protein for a woman weighing 56 Kg. In attempting to suggest what the adequate protein requirement is, one must bear in mind the various factors that affect the level of protein metabolism, namely, the individual's previous dietary habits, the states of nutrition, the age, the race and the sex, as well as the size, the amount of carbohydrate used or permissible because of its protein-sparing properties, and probably many other things.

It is impossible to state the optimal intake without experimental observation on each individual and, although opinion varies, we consider 1 Gm. of protein per each Kg. of body weight adequate for the average normal adult. It is certain, however, that health may be maintained on diets which furnish a protein intake that varies over very wide limits.

MINERAL ELEMENTS

The hidden mysteries of cell life which are slowly being unraveled are intimately connected with inorganic mineral elements and are recognized as essential participants in practically every metabolic process carried on by the body. Protoplasmic activity is regulated by the action of the mineral elements in solution in the protoplasm or attached to its colloids. The visible phenomena of life are the resultant of an enormous number of chemical and physical changes in the colloids of protoplasm and of exchanges between masses of protoplasm separated by membranes or interspaces. It is impossible to do more than mention briefly some of the elements and the present mineral requirements in health.

Different estimates have been given as to the various average elementary compositions of the human body. The body contains about twenty of the elements in appreciable amounts. These elements are often called ash constituents, minerals, mineral salts, inorganic elements, inorganic foodstuffs, and their metabolism commonly is discussed as the mineral metabolism. None of these terms is strictly and entirely appropriate.

Mineral Elements and Body Function. These mineral elements exist in the body and take part in its function in at least three ways:

1. As constituents of bones and teeth.
2. As elements of the chief solid constituents of the soft tissue.

3. As soluble salts (electrolytes) held in solution in fluids of the body, influencing the irritability, the conductivity and the permeability of tissues, as well as the acid-base equilibrium of the body.

Adequate amounts of these mineral elements are essential, and any great departure from the normal is incompatible with life. The chief ingredients are carbon, hydrogen, oxygen and nitrogen. These combine to make up approximately 96 per cent of the human body, while the many remaining mineral elements make up only a small amount, approximately 4 per cent. These 4 per cent play an important part in the mineral requirements. Some of the very minute amounts possibly have a definite significance in health and in disease.

Calcium. The American dietary is probably more deficient in calcium than in other ingredients. In fact, the importance of calcium in human nutrition and in health seems far greater than is even now commonly recognized. Ninety-nine per cent of the calcium is used by the body in bone and tooth structure; the remainder in body fluids and soft tissues. Individuals vary in their ability to utilize the calcium in their food. The presence of vitamins C and D in the diet is essential in calcium utilization. Similarly, there are optimal levels of phosphorous and fat intakes in relation to the calcium consumed which permit the calcium to be more completely utilized. Sherman states that the minimum requirement for equilibrium is 0.45 Gm. calcium per day. The standard allowance is 50 per cent above the minimum, or 0.68 Gm. calcium per day, and for a liberal margin of safety he allows 1.02 Gm. Leitch states that the evidence suggests that senile osteoporosis may be due in part to calcium deficiency, and that the daily minimum requirements approximate 0.8 Gm. per day from six months to two years of age, 0.9 Gm. from two to nine years of age, 1.0 Gm. from nine to fifteen years of age, 2.0 Gm. from fifteen to sixteen years of age, with a gradual decrease from sixteen to the adult level. The Food and Nutrition Board recommends for the average man or woman a daily calcium allowance of 0.8 Gm.; for the pregnant woman, 1.5 Gm.; for the nursing mother, 2.0 Gm.; and for children of all ages, 1.0 Gm. For practical purposes, the requirement approximates from 0.75 to 1 Gm. per day, which is the amount contained in one liter of milk (one quart).

Phosphorus. Phosphorus is widely distributed in the body, combined in many forms in soft and in hard tissues and associated with protein, carbohydrate, fat, various minerals and organic substances. Seventy per cent of the retained phosphorous combines with calcium, while nitrogen combines with the remaining 30 per cent. Phosphorus is essential in metabolism of fat and carbohydrate, and participates in many phases of metabolism and in the regulation of the proper hydrogen ion concentration in the tissues, the secretions and the excretions of the body. The form in which phosphorus is taken may have an important bearing on its nutritive value in the diet. The calcium-to-phosphorus ratio in the food intake has an important bearing on metabolism of both these elements. Phosphorus forms an integral part of the nuclear structure of every cell, and thus is intimately concerned in all cell multiplication. The dietary is often deficient in phosphorus despite its wide distribution as an inorganic element in food. Sherman states that the mineral requirement of phosphorus for equilibrium is 0.88 Gm. per day, the standard allowance is 50 per cent above the minimum, or 1.32 Gm., and for a liberal margin of safety it is 1.98 Gm. per day. The amount of phosphorus required by adults may range from 1 to 1.5 Gm. per day and be adequate.

Iron. The body of an adult contains, according to various estimates, between 3 and 5 Gm. of iron. The iron is known to function in two ways: (1) As a component of the hemoglobin molecule in the transport of oxygen by the blood; and (2) as a constituent of certain respiratory enzymes in cellular oxidation. Iron is not excreted in appreciable amounts, nor is it destroyed by the body. It is used over and over again, and in this respect its metabolism is distinctive. Gradually the understanding of the nutritional value of iron and the relation of deficiency of iron to anemia becomes a little clearer. The extent of the deficiency in this disease can be determined quantitatively at any time from the hemoglobin content of the blood, and the deficient factor—iron—can be supplied quantitatively. Increased demands for iron are noted during growth, pregnancy, lactation and menstruation. Heath and Patec state that the need of iron and the loss of it must play a primary role in the causation of hypochromic anemia, whereas dietary deficiency of iron or malabsorption of iron in a diseased gastro-intestinal tract is of secondary importance.

Although it cannot be said that adult man will become anemic if his diet contains too little iron, much can be said in favor of a diet containing adequate amounts of iron for the population at large. Blood loss of one sort or another is extremely common, particularly in females. Adequate stores of iron should be available in the body to meet such demands when they arise. Although Sherman states that the iron requirement per day varies from 10 mg. minimum to 22 mg. as liberal, the daily food of an adult should contain about 15 mg. The foods which have an abundance of iron are meat (especially liver), eggs, dried beans and peas, whole wheat, oatmeal, raisins and green vegetables, spinach and dried prunes. The average American dietary is not deficient in iron.

Copper. The human body contains from about 100 to 150 mg. of copper. This amount somehow enables the bone marrow to use iron in the synthesis of hemoglobin and forms certain copper protein compounds which have enzymatic activity. Copper is probably important in the physiology of the central nervous system and in some forms of pigment metabolism. Copper deficiencies in the human being are apparently rare, presumably because requirements for the metal are low and it is widely distributed in food. However, observations have been made of infants and children with hypochromic anemia who did not respond satisfactorily to iron therapy until copper also was given. No other manifestations of copper deficiency have been observed in man. That copper is essential for utilization of iron in hemoglobin synthesis is not disputed. However, the question may be raised as to whether deficiencies of copper occur in man of sufficient degree to be partly responsible for the development of hypochromic anemia. The Food and Nutrition Board of the National Research Council states that the requirement for copper for adults is in the neighborhood of from 1.0 to 2.0 mg. a day. Infants and children require approximately 0.05 mg. per Kg. of body weight. The requirement for copper is approximately one tenth of that for iron.

The following foods are good sources of copper: Liver, fish, poultry, whole-grain cereal, nuts, cocoa, mushrooms, legumes and leafy vegetables.

Cobalt. Denham observed that domestic animals in New Zealand which had bush sickness could be treated with amazing success by the addition of traces of cobalt to the diet. Kato found that cobalt when administered in doses of approximately one tenth that of iron appeared to accelerate the formation of erythrocytes and hemoglobin in the blood of infants with nutritional anemia. The requirements for cobalt are so low that experimental production of a deficiency is extremely difficult. There is no known reason for prescribing cobalt in the treatment of anemias as they occur in man. Man's requirement for this element is unknown.

Fluorine. The consideration of fluorine in any discussion of mineral elements is pertinent for at least two reasons: (1) Because of the undesirable effects associated with widespread chronic fluorine intoxication; and (2) because of the recent interest in the effect of fluorine on the incidence and the severity of dental caries. Fluorine associated with various minerals is widely distributed in nature, especially in areas rich in phosphates, in aluminum and in volcanic ash. It is present normally in very small amounts in plant and in animal tissues. Water passing through fluorine-rich mineral deposits becomes contaminated with the element, and consumption of this water during the period of tooth formation, particularly of the permanent teeth, results in a disease known as chronic endemic dental fluorosis, commonly called mottled enamel. Recognition that the disease is water-borne came in 1916, but it was not until 1931 that three independent investigations implicated fluorine a the causative agent. As fluorine acts du ing the period of calcification, the teet of the affected child erupt, showing characteristic signs. Instead of having the normal smooth, lustrous, translucent appearance, the teeth have dull, chalky whit patches distributed over the surface, an in some cases the whole tooth surfac may present a dead-white unglazed appearance. In addition, there may be discrete or confluent pitting of the enamel.

RELATION BETWEEN FLUORINE AND DENTAL CARIES. That the presence of fluorine in the diet decreases the incidence of dental caries is indicated by three types of evidence. In the first place, survey studies have demonstrated that the number of carious teeth per person is greater in communities which have a low fluorine water supply than in those in which the fluorine content is above one part per million. In cities in which the water supply has been changed to reduce the fluorine content from toxic levels, the incidence of caries is appreciably greater among children born since the water supply was changed than among those born before it was changed. Secondly, chemical analysis has shown that sound enamel, from sound teeth, contains more fluorine than that from carious teeth. Lastly, in animal experiments, rats have been found to develop less caries on a caries-producing diet when fluorine was added to their ration. The effective caries-preventing concentration of fluorine (from about 0.8 to 0.9 parts per million) is dangerously close to the concentration which causes mottled enamel. In addition to chronic dental fluorosis, fluorine occasionally causes the development of osteosclerosis. Because fluorine is widely used in industry and is used in insecticides and sprays, acute fluorine poisoning is not unusual.

Manganese. The occurrence of a manganese deficiency has never been recognized in animals or in man under natural conditions. Proof that the element is an essential nutrient has been obtained by the experimental production of deficiency in a number of laboratory animals. Requirements for manganese are apparently small and are easily obtainable from food because manganese is widely distributed in plant and in animal tissues. The human requirement for manganese is not known. The daily adult human diet contains approximately 4 mg. Plant foodstuffs are the chief source of manganese in the diet. Examples: Blueberries, the bran of cereals and nuts are particularly rich sources. Milk contains small amounts.

Zinc. Zinc deficiency in plants is well known and causes, in certain areas in Florida, a disease of citrus plants called little-leaf disease. There has been no evidence of zinc deficiency in man or in animals under natural conditions. Deficiency has been produced in rats and in mice. The metal, therefore, constitutes an essential element for at least some mammals. Zinc is widely distributed in tissues and in foods. The human body contains approximately 2.2 Gm., an amount considerably in excess of the other trace elements and almost as much as iron. Roughly, from 12 to 20 mg. are contained in the normal human diet. Zinc functions, at least in part, as a component of certain enzymes and is known to alter the hypoglycemic effect of insulin.

Magnesium. In certain instances, magnesium apparently has the ability to replace some calcium. About three fourths of the magnesium in the body is associated with calcium in skeletal formation and the remainder is present in the soft tissue and the body fluid. Knowledge of its specific function in human nutrition is meager. One of its most important functions in the body is that it serves in combination with organic radicals to form organometallic compounds which act as catalysts in physiologic activities. The actual retention of magnesium by the body at any age is very small. Its specific function in nutrition is unknown. Man's requirement for magnesium is not of great nutritional interest because the average mixed diet can, as a rule, be depended upon to supply this element in sufficient amount.

Sodium. Sodium is associated with the blood plasma and the extracellular fluids, although some serves as a part of the structure of the cartilage and the muscle cells. It functions largely with chloride and bicarbonate in control of the osmotic pressure and ionic equilibrium or electroneutrality of the body fluids and tissues. Considerably more sodium than potassium is needed in the body. Sodium is the most predominant positive mineral element in the extracellular fluids; it circulates throughout the entire body and serves generally in the metabolic processes of the body in connection with the maintenance of electroneutrality. The actual requirements of sodium and potassium are comparatively small, but the ratio between these two elements in the diet is considered to be of great practical importance. The high proportion of potassium to sodium in most common foods introduces two possible dangers, which may be evidenced metabolically by preventing full utilization of the sodium or by causing insufficient assimilation and utilization of other elements, especially calcium and phosphorus. Therefore, to compensate for the excess of potassium over sodium in foods and to enhance palatability, table salt is added to many foods incorporated in the daily diet. The body has a unique ability to conserve sodium in times of shortage, and to absorb and contribute sodium rapidly when it is introduced into the body.

Potassium. By virtue of its activity in relation to cellular water, potassium is associated with nitrogen metabolism. When new protoplasmic tissue is being formed, potassium is retained in sufficient quantities to meet the intracellular fluid needs of the newly formed cells. This alkaline mineral is held within the cells, although what activates and regulates its entrance into and exit from the cells is not completely understood. Irritability of the nervous system is dependent in large measure on the balance between calcium, potassium and sodium ions present in the tissues and the body fluids. A decided decrease in calcium increases irritability, and an increase in potassium will cause a similar effect. The proper mixture for balance among the salt solutions of the body is of fundamental importance for the maintenance of the integrity of function of cells and organs. One of the useful means of treating Addison's disease is a diet low in potassium. The intake of potassium is usually reduced to 2 Gm. daily. Wilder has reported that no untoward effects have been observed in patients with Addison's disease treated with a low potassium diet.

Chlorine. A component of all body secretions and excretions, chlorine is stored only to a limited extent in the skin and the subcutaneous tissue and in the skeleton. The chlorides of the blood, particularly sodium chloride, compose about two thirds of the blood anions. They play an essential role in maintaining electroneutrality within the body and serve in large measure to maintain the osmotic pressure of the extracellular fluids. Gastric secretion contains chlorine in free hydrochloric acid and combined in salts. Chlorine, like sodium and potassium, is lost through the skin to the extent of about one fifth of that retained. Human dietaries usually contain considerable quantities of sodium, potassium and chlorine, and it is only during diarrhea, excessive sweating and certain endocrine disturbances and metabolic conditions that an additional intake of these elements is required. Under ordinary conditions the body can adapt itself to shortages of these elements, and it is generally assumed that a diet that is adequate in all other respects will contain amounts sufficient to meet the nutritive demands. The actual daily need for chlorides expressed as the sodium salt is probably about 2 Gm. Animals will brave all sorts of danger to reach a "salt lick"; primitive peoples have gone to war in order to secure an adequate supply of salt. The gradual development of salt deficiency in a sedentary person leads to weakness, impaired mental acuity, excessive fatigue, anorexia and nausea. The so-called tropical neurasthenic is undoubtedly of this type. When there is excessive loss of sodium chloride in the sweat during hard work in a hot environment, disagreeable effects called heat cramps will follow.

Iodine. Iodine is widely distributed throughout all nature. It occurs in many forms, organic and inorganic. It is found in nearly all living things, as well as in the air, the water, the soil and the rocks. Not the sea, as is popularly believed, but the earth's crust is the major storehouse of iodine. Iodine is not uniformly distributed; it varies with the local geologic conditions of the soil and the water. Inversely related to the distribution of iodine is the incidence of endemic goiter. The highest incidence of goiter is found in the Alps, the Pyrenees and the Himalayas, the Thames valley in England, certain inhabited districts of New Zealand, the region of the Great Lakes and the Pacific Northwest.

Throughout the United States there are similarly varying degrees of iodine deficiency. A low occurrence of iodine, together with a high incidence of goiter, is especially prominent in the central plains of North America, in contrast with the low incidence of goiter on the seacoasts, where large amounts of high iodine-containing sea foods are consumed. On the other hand, the district of Salt Lake City has a high incidence of goiter, though the water of Great Salt Lake has a higher iodine concentration than the ocean. However, neither vegetation nor fish for human consumption comes from the nearly lifeless waters of the Great Salt Lake. The incidence of goiter can be correlated with the iodine intake of a given region. The results of iodine treatment of goiter have been so successful and so well recognized by the public that they constitute a chapter unique in the history of nutrition. Fortunate was the empiricism which led the ancients to use burnt sponge or seaweed in the treatment of goiter. Iodine was then unknown. It was not until the year 1811 that iodine was accidentally discovered by Courtois as a by-product resulting from the use of seaweed in preparing war materials for Napoleon. Within a few years Sir Humphrey Davy had isolated iodine from sponges, seaweed and other forms of marine life. Thence followed a fruitful century of clinical investigation, extending from Straub of Berne to Plummer of Rochester. Today, iodine prophylaxis against goiter is most widely recognized, while iodized salt is used throughout the entire United States, even on Nantucket Island and in the Philippines. The normal thyroid gland stores about 25 mg. of iodine. Marine believes that the yearly requirements probably do not exceed 50 mg. In iodine deficiency, iodine in the form of iodized salt may be administered. Plummer and Haines give a few drops of compound solution of iodine once a week and feel that this is adequate. The daily iodine requirement lies somewhere between 100 and 200 mg.

Sulfur. A nutritionally essential element, sulfur has a far-reaching significance in the body. It is a component of glutathione, insulin, thiamine and the organic matrix of the bone. Sulfur and nitrogen metabolism are closely related in protein metabolism. Only two naturally occurring sulfur-containing amino acids —cystine and methionine—are known, and they account for a large portion of the sulfur consumed and utilized in the processes of metabolism. Man obtains sulfur largely from protein, as is evidenced by the fact that the metabolism of this element parallels that of nitrogen. There is ordinarily no reason, with the average diet, to fear a lack of sulfur.

Trace Elements in Nutrition. Traces of other mineral elements in very minute amounts, such as silicon, aluminum, boron, chromium, caesium, lithium, molybdenum, rubidium, silenium, silver, strontium, tellurium, titanium and vanadium, and even arsenic, may be normal constituents of the body, but as yet their role is not definitely known.

Acid- and Base-forming Foods. The acid- and the base-forming qualities of foods have received considerable attention from some clinicians and a great deal of incoherent discussion by laymen. In general, one should take at least enough alkaline ash foods to balance or neutralize the effect of the acid ash foods. The best health of the tissues depends on maintaining a slight preponderance of bases over acids in the body. The normal diet presented on pages 58 and 59 has an excess of alkaline ash foods.

Types of Ash. When food is digested it is absorbed into the system and carried by the blood to the tissues, where energy and heat are derived by the oxidation of the organic or combustible parts of food in the process of metabolism. The mineral elements or ash left may be of three types—the neutral, the acid-forming or the alkaline-forming constituents. A general classification is given below to show which foods in general yield the neutral, the acid and the alkaline ash.

TABLE 2A

Acidity of Certain Foods
(Sansum, Blatherwick and Smith)

	CC. N. ACID PER 100 GM.
Bread, white	2.7
Bread, whole-wheat	3.0
Corn, sweet, dried	5.95
Cracker	7.81
Cranberry	*
Egg	11.10
Egg white	5.24
Egg yolk	26.69
Fish, haddock	16.07
Fish, pike	11.81
Meat, beef, lean	13.91
Meat, chicken	17.01
Meat, frog	10.36
Meat, pork, lean	11.87
Meat, rabbit	14.80
Meat, veal	13.52
Oyster	30.00
Oatmeal	12.93
Peanut	3.9
Prune, plum	*
Rice	8.1

* The ash of these foods is alkaline, but because of contained substances which form hippuric acid in the body, they increase the acidity of the urine.

TABLE 2B

Alkali-producing Foods
(Sansum, Blatherwick and Smith)

	CC. N. ALKALINE PER 100 GM.
Almond	12.38
Apple	3.76*
Asparagus	.81
Banana	5.56*
Bean, dried	23.87
Bean, Lima, dried	41.67
Beet	10.86
Cabbage	4.34
Carrot	10.82
Cauliflower	3.33
Celery	7.78
Chestnut	7.42
Currant, dried	5.97
Lemon	5.45
Lettuce	7.37
Milk, cow's	2.37
Muskmelon	7.47*
Orange	5.61*
Peach	5.04
Pea, dried	7.07
Potato	7.19*
Radish	2.97
Raisin	23.68
Turnip	2.68

* These foods have been found experimentally to be very efficient in reducing the acidity of the body.

NEUTRAL ASH	ACID ASH
Butter	Egg
Cream	Meat, fish and poultry
Oil	Oyster
Lard	Bread of all kinds
Sugar	Cereals
Cornstarch	Pastries
Tapioca	Puddings

ALKALINE ASH

- Milk
- Nuts
- Fruits (except cranberries, plums, prunes and rhubarb)
- Vegetables (especially legumes and white potatoes)

A more detailed list of foods is presented in Tables 2A and B on page 16. This shows the comparative value of the net ash content per 100 Gm. in terms of cubic centimeters of N/10 acid or alkali needed to produce neutrality.

VITAMINS

The discovery of the vitamins is typical of other scientific discoveries. It started with vague surmises and gropings in the dark until a few salient facts were well established and formed a needed foundation for work in laboratories. At the beginning of the present century, nutritional research was still chiefly concerned with the study of carbohydrates, fats and proteins. These, with the addition of minerals, such is iron and calcium, were believed to supply all the needs of the body. This simple conception of nutrition was accepted until just before World War I, when it was shown that natural unrefined foods contained hitherto unrecognized substances essential for life. These investigations developed the fact that food of sufficient nutrients, minerals and water was not necessarily adequate to meet all the requirements of nutrition. Thus it was found that certain substances called vitamins that are present in the normal dietary in infinitesimal quantities —far too small to yield any contribution to the energy supply of the body or to the bulk as structural elements of the tissues—had great importance in the body's nutritional functions. The discovery of vitamins revolutionized the outlook not only in dietetics but also in the study of disease. The realization that many human diseases were not caused by infections or toxins, but simply by vitamin deficiencies in food, led to the conception of deficiency diseases. Vitamins were discovered at a singularly opportune moment. By the beginning of this century there was a great decrease in the consumption of fresh and unrefined foods. There was an ever-increasing consumption of white flour and sugar. These insidious changes in the nation's food caused, and still cause, mild or even severe vitamin deficiencies. During the last thirty years an ever-increasing amount of research has been devoted to the study of vitamins. Unfortunately, this knowledge has spread throughout the literature of three decades, and much of it is not easily available. The magnitude of this literature makes it well-nigh impossible for clinicians and others to keep abreast of the subject. Clinical vitamin research offers the general practitioner who has the opportunity for long and intimate observation an ideal field. Many of his observations remain unpublished because he does not know whether they are new or old. This is to be regretted, since many common problems of general practice are never seen in hospital work and must be dealt with by the practitioner and not the consultant. The importance of vitamins in nutrition should not need any emphasis. Wise feeding is the greatest weapon preventative medicine can wield. People in the main are apathetic toward the problem and are content to spend their lives in that shadowed region between good health and frank illness. There is a wide gap between the minimum diet, which just prevents deficiency symptoms, and the optimum, which promotes good health and high efficiency. Subnormal nutrition may be present even when there are no obvious clinical signs. Human subjects who have volunteered to go on experimental diets deficient in one or another of the vitamins generally complain of tiredness and fatigue before any other recognizable sign of deficiency occurs. Fatigue is one of the commonest complaints met with by the physician, and it is not unreasonable to associate it in some cases with vitamin deficiency in the patient.

The principal functions of vitamins in human nutrition are:

1. To promote and maintain health and optimal growth and
2. To prevent or cure deficiency disease.

A deficient intake of one or more of the vitamins does not always result in a specific disease, but it may bring about changes of specific structure which make for inevitable susceptibility to a latent deficiency disease.

FAT-SOLUBLE VITAMINS

The fat-soluble vitamins are generally subdivided into vitamins A, D, E and K. We will discuss a few known facts about each fat-soluble vitamin, their sources, human requirements and the clinical effects of their deficiencies or usage.

VITAMIN A

Evidence reveals that there exists, in addition to vitamin A, another compound which has been designated as vitamin A_2. In chemical structure, vitamin A_1 is related closely to vitamin A_2. Biologically, the activity is the same. Vitamin A predominates in the tissues of salt-water fish and vitamin A_2 predominates in the tissues of fresh-water fish. The absence of vitamin A_2 in the liver of mammals and other land animals probably can be explained by the absence of vitamin A_2 in their food. Vitamin A is a fat-soluble compound. Apparently its absorption is facilitated greatly by the simultaneous absorption of a certain amount of fats. The precursors of vitamin A are all the carotenoid pigments commonly called carotene. Since most of the vitamin A comes in the form of carotene, some knowledge of its metabolism is important. The absorption from the intestine of either vitamin A or carotene requires the presence of fat. For the absorption of carotene, bile salts are also required. However, some vitamin A appears to be absorbed in the absence of bile or bile salts, though absorption of it is more efficient when one or the other is present. In general, it may be considered that the same factors which affect the absorption of fats also affect the absorption of vitamin A and vitamin A active carotenoids, a principle which, if borne in mind, will solve a good many practical problems as to the therapeutic use of these latter substances. Some of the diseases associated with abnormally poor absorption of vitamin A active substances are celiac disease, cystic fibrosis of the pancreas, congenital obstruction of the bile ducts, intestinal obstruction, ulcerative colitis, dysentery, diarrhea and many diseases involving severe liver damage or dysfunction. Many investigators have observed that the administration of petrolagar (mineral oil) simultaneously with carotene, or shortly before or after meals, will prevent the absorption of carotene. To a much smaller extent this appears to hold for the absorption of vitamin A. It has been found to be the case with both plain petrolatum and petrolatum in agar mixtures. The phenomenon is due to the fact that carotene, a hydrocarbon, is partitioned in the gut between the lipids and the ingested petrolatum in favor of the latter. The use of petrolatum in place of salad oils in reducing diets is, therefore, detrimental to the most effective use of the vitamin A values of the foods consumed. If petrolatum is to be used for the relief of constipation, it should be taken just before retiring—never near or at mealtime. After absorption, the greater portion of carotene is held in the liver, where it gradually disappears in the Kupffer cells as the concentration of vitamin A in the liver increases. The liver probably stores about 95 per cent of the reserve of vitamin A in the body.

Sources. The foods which supply man with vitamin A in greatest abundance are carrots, liver, milk, eggs and the green vegetables, especially the vegetables of the leafy variety. Although green vegetables are rich sources, the completeness with which they yield this factor during digestion determines, in a measure, their vitamin A values. Animal food products, such as liver, eggs and milk, contain a relatively larger proportion of the vitamins and less of their precursor, and, therefore, their yield of vitamin A is more complete; but the richness of such food in this respect depends in turn on the ration of the animal supplying it.

Human Requirements. For the average man and woman of 70 Kg. and 56 Kg., respectively, the daily allowance is 5,000 units. In the latter half of pregnancy, 6,000 international units are required, and during lactation 8,000 international units. For children of less than a year, 1,500 units are required; for those from one to three years, 2,000; for those from four to six years, 2,500; for those from seven to nine years, 3,500; and for those from ten to twelve years, 4,500. For children more than twelve, and not more than fifteen years of age, 5,000 units are required. For those from sixteen to twenty years of age, 6,000 units. Allowances in all these instances may be less if provided by vitamin A and greater if provided chiefly by the provitamin carotene.

Clinical Effects of Vitamin A Deficiency

Relation to Infection. Enough evidence indicates that there are many other factors of greater influence in infections than vitamin A, and there is no justification for calling vitamin A the anti-infection vitamin. Few investigators doubt that severe deficiency of vitamin A, or any vitamin, will lower resistance to infection. Almost all will agree that administration of vitamin A during the course of any infection will have little beneficial effect on the outcome, unless such a deficiency is present. Evidence to date does not indicate that well-nourished people have anything to gain from excessive doses of vitamin A. Much research recorded in the medical literature of past years fails to show any diminution in the frequency of low-grade infections (colds) attendant upon the administration of more vitamin A than is to be found in an average mixed diet of good nutritive quality.

Eye Changes. The most clear-cut effect of lack of vitamin A is night blindness. Vitamin A is the precursor of visual purple, as well as the product of its decomposition. Apparently vitamin A unites in the retina with the protein to form visual purple. This, of course, takes place continuously and depends on a sufficient supply of vitamin A. Night blindness can be cured by eating food rich in vitamin A—liver, for example. The dramatic quickness of both the onset and the cure explains why liver has been used for centuries for night blindness. The Ebers papyrus, written about 1600 B.C., probably referred to night blindness when liver was recommended for the eyes, while the Chinese in 1500 B.C. were giving liver, honey, flying-fox dung and tortoise shell, all of which would have cured night blindness. Hippocrates advised the whole liver of an ox dipped in honey. Xerosis, xerophthalmia and keratomalacia may in general be considered progressively severer stages of the same disease of the eye, the last-named complicated by secondary infection and destructive changes. All forms have been recognized as occurring in association with, and under, conditions which produced night blindness.

Epithelial Changes. Dryness and scaliness of the skin are perhaps some of the earliest manifestations of involvement of the skin resulting from deficiency of vitamin A. The effect of a deficiency of vitamin A on the epithelium is an atrophy of the cells, followed by a replacement with undifferentiated epithelium through proliferation of the basal cells. This results in a stratified, cornified epithelium similar to the epidermis and the same in all structures, irrespective of their original structure or function. Disturbances in function result from this altered nature of the epithelium and the presence of masses of dead, cornified cells. Glandular structures, such as the sebaceous and the sweat glands, diminish their secretion or cease entirely. Ducts are plugged, specialized epithelial surfaces become replaced by a flat keratinized surface. The skin becomes dry and rough, and there is hyperkeratosis of the hair follicles which develops into a papular eruption about the pylosebaceous follicles. Hairs are broken off and lost. In some cases the dryness and the roughness of the skin are less noticeable and the eruption resembles acne. There may be a dirty slate-gray pigmentation, and in cured cases spots of pigmentation may remain about the area of the papule. There is hyperkeratinization of the epithelium lining the follicle, hyperplasia of the adjacent epidermal cell and moderate hypertrophy of the horny layer. The epithelium of the respiratory tract shows the keratinizing changes in all sites. Similar keratinization of the epithelium is found in many accessory sinuses, the nares and the eustachian tubes, as well as in the salivary glands.

VITAMIN D

The early history of vitamin D is the history of rickets. It is a depressing history, a history of perfect clinical observation on the cure of a disease having been forgotten again and again for a century and a half. Ten chemically distinct forms of vitamin D have been described, but only two of them are of practical importance. One is ergosterol, which on exposure to ultraviolet light becomes viosterol, and the other is activated 7-dehydrocholesterol. This substance is present in animal fats and the active form is produced in the skin, the feathers or the furs of animals exposed to sunlight or other sources of ultraviolet waves. The active vitamin D formed in the skin is absorbed by the blood. When the vitamin is ingested, it is readily absorbed from the intestinal tract if adequate amounts of bile salts are present. The chief storehouse of vitamin D in the human being is the liver, but significant amounts also are stored in the skin, the brain, the lungs, the spleen and the bones. Although the liver is the chief storehouse of the vitamin, normal hepatic function is necessary to promote the antirachitic action of vitamin D. The function of vitamin D is to control the retention of calcium and phophorus in the body and its metabolism in such manner as to make possible the orderly calcification of bone. The exact role of vitamin D in the metabolism of calcium and phophorus is not yet fully established.

Sources. The food sources of vitamin D are very meager; only a few of the foods in the average American diet contain it. The natural foods which carry this vitamin are of animal origin, first among them being fish, such as herring, sardine, tuna and salmon. Small amounts are present in eggs. The low vitamin D potency of natural foods can be increased by artificial means, by the addition of D-fortified material to the feed of animals which yield foodstuffs, by the irradiation of foods which contain the activable provitamin, or, where feasible, by the addition of concentrates directly to the food. The fortification of foods with vitamin D is now an accepted procedure. Bread, eggs, cereals and other common articles of diet have been enriched in one or another of these ways. Milk, of course, because it is widely consumed, has gradually come to be the most commonly chosen staple for fortification. Various types of preparation of vitamin D are now available—cod-liver oil, liver oil of other fish, fish-liver-oil concentrates and artificially activated preparations.

Human Requirements. Except in the tropics, most, if not all, growing children need vitamin D to prevent rickets and to ensure optimal development of muscles and other soft tissues which contain phosphorus in quantity. Pregnant women need vitamin D to ensure that the requirements of the fetus shall be met. The same is true of nursing mothers. The need of individuals who are fully grown for vitamin D is less certain. The requirement of vitamin D during adult life remains to be determined. During pregnancy and lactation, and for children under one year of age, from 400 to 800 international units of vitamin D are the daily requirement recommended by the Food and Nutrition Board of the National Research Council. There is an extremely wide margin between therapeutic and toxic doses of vitamin D. Toxic effects may be produced by the administration of enormous amounts of this factor—more perhaps than 150,000 units daily. Some adult persons treated with large doses of vitamin D have complained of nausea, headache, diarrhea, anorexia, urinary frequency and lassitude.

Clinical Use of Vitamin D

The most valuable therapeutic properties of vitamin D are its capacity to restore to normal the disturbed equilibrium of calcium and phosphorus in rickets and osteomalacia, and in the hypocalcemic tetany which complicates these disorders. Spasmophilia, the nervous symptoms of rickets, is so important that it is often discussed as if it were a different condition. It is true that some of the worst cases, those with generalized convulsions or prolonged attacks of tetany, show only very slight signs of an underlying rachitic condition. Osteomalacia of pregnancy, hunger osteomalacia, probably many cases of senile osteoporosis, are fundamentally all the same, being due to a deficiency of vitamin D. In the past they were not recognized as identical, because the obvious cause appeared to be repeated pregnancies, famine or old age rather than a common vitamin lack. They are, indeed, the adult equivalent of low-calcium rickets modified by the absence of growth. Vitamin D is effective only in cases of hypocalcemic tetany. It has no effect in cases of tetany caused by the alkalosis of vomiting, hysterical hyperpnea, overdose with sodium bicarbonate or tetany produced by various chemical agents. Vitamin D has been recommended for the treatment of a considerable variety of unrelated disorders—arthritis, hay fever, psoriasis, the bleeding tendency of obstructive jaundice, the toxemias of pregnancy and, in certain instances, for burns and other purposes, for which it is put up as an ointment. The use of vitamin D in treating arthritis should not be relied on as the only form of treatment, for seldom is the course of the disease favorably altered. It leaves one with the general impression that other forms of treatment over such a long period would perhaps have as good results without the very real danger of toxic damage. The evidence offered in the literature in favor of the use of vitamin D in the treatment of the last unrelated disorders mentioned seems hardly justifiable. Most of the results in the literature reported have not been adequately confirmed.

VITAMIN E

Herbert McLean Evans will always have his name associated with the vitamin E, partly because he and Bishop in 1922 demonstrated the existence of an antisterility vitamin and partly because of the monograph on vitamin E written by him and Burr in 1927. This work remains to the present day the foundation of our knowledge of vitamin E. When vitamin E is compared with the other vitamins, it assumes a rather unsatisfactory position, inasmuch as it has never been demonstrated that a deficiency of this substance occurs in man. There are more than 130 compounds which exhibit vitamin E activity. The most active of these compounds are the tocopherols. The tocopherols are readily soluble in lipoid solvents, resist high temperatures and lose their activity in the presence of mild oxidizing agents. In animals, a lack of vitamin E manifests itself chiefly by changes which it causes in the reproductive mechanism and in the muscular and the nervous systems. In the female rat, conception is followed by resorptive sterility, and in the male rat, degeneration of the germinal epithelium and the spermatozoa develops to the point of complete loss of reproductive power. Absence of vitamin E in certain animals, rabbits and guinea pigs is followed by muscular dystrophy and characteristic paralysis of the hind quarters.

Sources. Wheat germ and wheat-germ oil are found to have a remarkably high content of vitamin E and remain to this day the best source. The foods richest in the vitamin are green leaves and the germ of seeds; considerable amounts, therefore, are found in cottonseed oil, lettuce oil, rice-germ oil.

Human Requirements. The human requirements of vitamin E are completely unknown. No toxic reactions have been reported in cases in which small doses were administered, and large doses of wheat-germ oil have given rise only to minor symptoms. The danger of the production of neoplasms after the continued ingestion of large doses of tocopherols appears to be nonexistent.

Clinical Use of Vitamin E

If one hastily appraises the current literature, he may be inclined to feel that in vitamin E there is perhaps a potent weapon for attack on habitual abortion, sterility, menstrual disturbances and various myoneurogenic diseases.

The successful treatment of habitual abortion with wheat-germ oil has been reported by several investigators. The results in most cases were difficult to interpret and evaluate. Adequate controls were impossible.

Vitamin E has sometimes seemed indicated in various types of muscular dystrophies and atrophies, but here again numerous conflicting reports have appeared. Several of them have been favorable, especially in primary dystrophies and amyotrophic lateral sclerosis. In addition to its use in habitual abortion and muscular dystrophy, vitamin E has been suggested in the toxemias of pregnancy and in the stimulation of growth in the premature infant. In general, the results obtained with vitamin E for the treatment of various clinical disturbances in human beings have been disappointing.

VITAMIN K

Between 1929 and 1933 several observers described a hemorrhagic disease in chicks fed on diets poor in fats. In 1934, Dam suggested that this hemorrhagic tendency in chicks was a definite dietary deficiency due to lack of a fat-soluble factor, and in the next year proposed that this factor be called vitamin K (Koagulations-vitamin), a name that has been generally adopted. In early attempts to isolate vitamin K, crude extracts were prepared from various sources—hog-liver fat, fish meal, rice bran, soybean oil, young sprouts of oats, particularly alfalfa. In 1939, the pure vitamin was isolated from alfalfa and another K compound from fish meal after bacterial putrefaction. A few months after these discoveries the synthesis of vitamin K was reported. Vitamin K is essential for normal blood coagulation. The term antihemorrhagic vitamin for vitamin K is misleading. It does not arrest hemorrhage in normal persons or in those suffering from hemophilia, purpura or bleeding diseases. As far as is known, vitamin K has only one function in the body; it is essential for the formation of prothrombin, the level of which falls in subjects deficient in vitamin K. Vitamin K is either one of the building stones necessary for the formation of prothrombin or, what is more likely, it stimulates the liver to a normal prothrombin production. Little is known of the metabolism of vitamin K after its absorption. The failure of the blood-clotting mechanism in hypovitaminosis K is due to a deficiency of prothrombin. This depletion often develops rapidly. Administration of vitamin K results in a rapid increase in prothrombin, hence it is assumed that vitamin K is involved in the formation of prothrombin. The mechanism by which vitamin K acts is unknown. Heparin also plays a part in the mechanism of blood clotting. It delays coagulation when injected into a normal person, but it is not a natural antagonist of vitamin K, since it affects another part of the clotting mechanism. The liver is the site of prothrombin formation. Extensive hepatic damage in the human being is associated with hypoprothrombinemia. If the hepatic injury is severe enough, the administration of vitamin K is not effective in correcting the prothrombin deficiency. With regeneration of the liver, the blood prothrombin returns to normal levels.

Sources. Green plants are the richest sources of vitamin K, although moderate amounts are found widely distributed in the animal body. Alfalfa and spinach are rich sources of the vitamin. Other plants with a fairly high vitamin content are cauliflower, cabbage, carrot tops, kale, soya bean, chestnut leaves, pine needles and seaweed. It is also present in tomatoes, hempseed, bran and orange peel. The green parts of the plant contain more than the fruits, the seeds and the roots. Most fruits are poor sources of vitamin K. Vitamin K is also found widely distributed throughout the animal body. Bacteria can synthesize vitamin K.

Human Requirements. The human requirements of vitamin K are not known. Bacterial synthesis of the vitamin can occur in the large intestine, but whether adult man needs an exogenous source is unknown. It is assumed that he does, as dietary vitamin K deficiency in man has been reported. For the healthy adult the amount of vitamin K supplied by a normal diet and bacterial synthesis in the bowels is enough to maintain the body stores of vitamin K and prothrombin. Apparently a completely adequate diet for the pregnant woman is not always entirely sufficient to protect the newborn child from the potential dangers of hypoprothrombinemia. This may indicate an increased need of the mother prior to parturition. When the normal dietary intake is reduced as a result of poverty, eccentric dietary habits, functional digestive disorders, faulty planning of food or systemic disease, minimal degrees of hypoprothrombinemia may occur. Interference with absorption or utilization results in a development of clinical degrees of hypovitaminosis K. Pure vitamin K, or an effective analogue of it, in doses of from 1 to 2 mg., if properly absorbed and utilized, will usually correct a vitamin K deficiency.

Clinical Uses of Vitamin K

Vitamin K cannot be used merely to check bleeding, irrespective of its origin; nor has it any appreciable effect on the prothrombin levels of subjects not suffering from hypoprothrombinemia. It does not appear to be of value in hemophilia, in purpura and in diseases of the blood-forming organs, for although there is a tendency to bleed in these conditions, there is no deficiency of prothrombin; nor is the vitamin effective for the control of hemorrhage in the normal individual. It is indicated chiefly for the prevention and the treatment of hemorrhage associated with jaundice and liver damage (cholemic hemorrhage) and the hemorrhagic diathesis of the newborn. It is now being realized that prothrombin deficiency may be encountered in other conditions, particularly those associated with an abnormal state of the gastro-intestinal mucosa, which interfere with the absorption of the vitamin. Patients with gastro-intestinal disease also consume diets poor in vitamins. Instances of vitamin K deficiency have been seen in ulcerative colitis, in polyposis of the colon, in regional ileitis, in pyloric obstruction, in sprue and in gastrojejunocolic fistula. Low prothrombin levels have been recorded in severe diarrhea, in intestinal obstruction, in multiple strictures, in mesenteric obstruction, in hemorrhagic retinitis, in pseudohemophilia, in hepatica of childhood, in malnutrition and in cachexia. The hemorrhagic tendency in patients suffering from obstructive jaundice and diseases of the liver has long been known and constitutes a distinct hazard in the case of patients submitted to surgery. The low prothrombin level of the blood in newborn infants satisfactorily explains the pathogenesis of hemorrhage of the newborn, which is characterized clinically by hemorrhage in the gastro-intestinal tract, by bleeding from the cord, the nose, the palate, the genito-urinary tract and the vulva, and by intracranial hemorrhage. The commonest first symptom is the passage of a large tarry stool; but the condition may be ushered in by hematemesis, bleeding from the umbilicus, pallor due to internal hemorrhage or rapid enlargement of the cephalhematoma. Certain drugs, such as organic arsenicals,

FAT-SOLUBLE VITAMINS

VITAMIN A

Functions in the Body

Promotes growth and longevity.
Maintains the integrity of the epithelial tissues.
Increases body's ability to resist infections.
Important aid in preserving health and vigor.
Promotes appetite and digestion.
Essential for normal reproduction, lactation and rearing of young.

Clinical Features of Deficiencies or Absences

Retardation of growth and development.
Substitution of keratinized epithelium for normal epithelium with diminished resistance to infections of:
- Eyes (night blindness and xerophthalmia)
- Tear glands (loss of power to produce tears)
- Sinuses (pus) and ears (otitis media)
- Glands at base of tongue (abscesses)
- Salivary and lymph glands
- Respiratory tract
- Genito-urinary tract (renal calculi)
- Alimentary tract
- Skin—keratosis follicularis (Darier's disease)

Diarrhea.
Physical weakness.
Failure of appetite and digestion.

Relative Distribution of Vitamin A in a Few Common Foods

Most Potent		Excellent		Good	
Plant	Animal	Plant	Animal	Plant	Animal
	Halibut-liver oil Cod-liver oil Tunafish-liver oil	Alfalfa Broccoli Carrots, raw Lettuce Spinach Tomatoes Water cress	Butter Cheese Cream Egg, yolk Milk: whole cow's fresh dried evaporated	Vegetables Artichoke Asparagus Cabbage Celery Chard Corn (yellow) Pumpkin Dandelion greens Peas, green Pepper (green) Squash Beans, string Sweet potatoes (yellow) Carrots, cooked Fruits Apricots Avocados Bananas Oranges Peaches Pineapples Prunes	Clam Glandular organs: liver kidney Oyster, raw Milk, human

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Average adult	5,000 U.S.P. units	Children up to 12 years	1,500–4,500 U.S.P. units
Pregnancy (latter half)	6,000 U.S.P. units	Children over 12 years	5,000 U.S.P. units
Lactation	8,000 U.S.P. units	Boys 16 to 20 years	6,000 U.S.P. units

Daily Therapeutic Dosage

According to needs of patient up to 100,000 units

FAT-SOLUBLE VITAMINS
VITAMIN D

Functions in the Body

Prevents and cures rickets.

Regulates the absorption and the metabolism of the bone-forming elements—calcium and phosphorus.

Aids in preventing tooth decay.

Clinical Features of Deficiencies or Absences

Rickets (bone disease).

Deformities of bones:

- Soft and fragile bones
- Enlargement of wrists and elbows
- Enlargement of rib junctions (beading)
- Bulging forehead
- Softening of cranial bones
- Delayed closing of fontanelles
- Malformation of chest and of pelvis
- Bowed legs

Spasmophilia (infantile tetany).

Osteomalacia.

Faulty absorption, retention and deposition of the bone-forming elements—calcium and phosphorus—in the body.

Defects in teeth (caries, poorly calcified teeth).

Low content of calcium and phosphorus in blood and in bones.

General muscular weakness and instability of nervous system.

Relative Distribution of Vitamin D in a Few Common Foods

Most Potent		Excellent		Good	
Plant	Animal	Plant	Animal	Plant	Animal
Plant sources as a class are practically devoid of vitamin D	Halibut-liver oil		Egg, yolk		Butter (variable)
	Cod-liver oil		Salmon		Clam
	Sunlight, direct (most potent in summer)		Sardines		Milk, whole (variable)
	Tunafish-liver oil		Herring		Oyster

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Infants	400–800 U.S.P. units
Children 1 to 20 years	400 U.S.P. units
Pregnancy (latter half)	400–800 U.S.P. units
Lactation	400–800 U.S.P. units

For persons who have no opportunity for exposure to clear sunshine and for elderly persons the ingestion of small amounts of vitamin D may be desirable. Other adults probably have little need of vitamin D.

Daily Therapeutic Dosage

Rickets:	1,000– 20,000 I.U.
Parathyroid tetany:	100,000–200,000 I.U.
Arthritis:	100,000–500,000 I.U.

FAT-SOLUBLE VITAMINS
VITAMIN E

Functions in the Body*

Essential for normal reproductive function:
- Required for normal germ-cell maturation in male
- Required for normal placental function in female

Muscular dystrophy.

Clinical Features of Deficiencies or Absences

Failure in reproduction (sterility):
- Degeneration of germinal epithelium in male
- Failure in placental function in the female
- Disturbance in gestation (death and resorption of developing young)

Primary dystrophies.

Primary fibrositis.

Relative Distribution of Vitamin E in a Few Common Foods

Most Potent		Excellent		Good	
Plant	Animal	Plant	Animal	Plant	Animal
Wheat-germ oil		Lettuce Water cress Wheat germ Spinach		Alfalfa Barley Beans Corn, whole Molasses Oats, whole Oils, vegetable cottonseed corn Peas Rice, whole Wheat, whole	Meat Milk Eggs Butter Cheese

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Requirements not established.

Daily Therapeutic Dosage

100 mg. (alpha tocopherol equiv.) or more by mouth.

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* The functions and the clinical features of deficiencies or absences are the result of animal experimentation. Only the reports of Paulsson and Vogt-Moller have demonstrated the possible influence of vitamin E in pathologic changes in man.

FAT-SOLUBLE VITAMINS

VITAMIN K

Functions in the Body

Promotes a normal prothrombin content of the blood.

Clinical Features of Deficiencies or Absences

Generalized hemorrhage with low clotting power of the blood due to reduced content of prothrombin.

Hypoprothrombinemia, as in:
- Primary dietary deficiency
- Obstructive jaundice or biliary fistula
- Primary hepatic disease
- Certain intestinal diseases
- Physiologic hypoprothrombinemia of the newborn

Relative Distribution of Vitamin K in a Few Common Foods

Most Potent		Excellent		Good	
Plant	Animal	Plant	Animal	Plant	Animal
Alfalfa	Putrefied fish meal	Chestnut leaves		Algae	Liver (pork)
Spinach		Cabbage leaves		Tomatoes	Fish meal
		Cauliflower		Peas	
		Nettle leaves		Strawberries	
		Pine needles		Carrots	
		Seaweed		Potatoes	
				Orange peel	
				Cereals	
				Parsley	

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Requirements not established.

Daily Therapeutic Dosage

Synthetic vitamin K derivative 1–4 mg.

sulfonamides, aspirin and salicylates, are known to produce hypoprothrombinemia. It has been recorded that vitamin K therapy can raise a lowered prothrombin level when this is due to sulfonamide, aspirin or salicylate therapy. Large doses of a soluble vitamin K analogue, from 60 mg. to 1 Gm., preferably intravenously, counteract the action of dicoumarol. In the newborn child a decline in prothrombin content of the blood occurs during the first few days of life. The explanation of this is not entirely clear. If this decrease is of sufficient degree, however, hemorrhage will occur usually in the cranial cavity. Vitamin K administered to the mother before delivery, or to the child immediately after birth, controls this condition. Both procedures should preferably be followed. The use of vitamin K as a medicine for both mother and child in maternity cases is a practical public-health measure and should be a matter of routine procedure.

Water-Soluble Vitamins

The water-soluble vitamins are generally subdivided into vitamin C and B complex components, together with related factors. The individual chemical compounds are soluble in water, although the degree of solubility may vary greatly, from the sparingly soluble riboflavin to the readily soluble ascorbic acid. Their functions in the living cell differ greatly and their chemical structures vary from the simple configuration of nicotinic acid to the more complicated molecular structure of thiamine and riboflavin.

The term vitamin B complex is applied to a group of substances formerly thought to be only one entity and called vitamin B. A dozen water-soluble factors at least are now known to occur together commonly in nature, as in liver and in yeast, and are included under the term vitamin B complex. Those to be considered here are:

Thiamine—B_1
Riboflavin—B_2 or G
Nicotinic acid (Niacin)
Pyridoxine—B_6
Pantothenic acid
Choline
Inositol
Folic acid and/or L. casei factor
Biotin
Para-aminobenzoic acid

We will discuss a few known facts about each water-soluble vitamin, its sources, human requirements and the clinical effects of its deficiencies or usage.

VITAMIN C

Scurvy was for long a menace to seafarers, explorers and armies, although the first recorded accounts of the disease are to be found among the writings of the physicians who accompanied the crusaders in the thirteenth century. The decline of scurvy in Europe coincides with the introduction of the potato in the early seventeenth century and the increased consumption of vegetables and fruit. Today, frank scurvy is practically a disease of the past. After Funk's postulation in 1912 of a scurvy-preventing or antiscorbutic vitamin—vitamin C—attempts were made to isolate it from orange and lemon juice.

In 1928, Szent-Gyorgyi actually isolated vitamin C from cabbage and adrenals without knowing it, during the course of studies on cellular oxidation. In 1933, Szent-Gyorgyi and Hayworth suggested the name ascorbic acid for vitamin C, to denote its antiscorbutic action. Vitamin C is essential to all animal life—to those animals which, like man, are incapable of synthesizing it. A continual external supply of it is necessary for existence. Though the vitamin C requirements are not large, they are imperative, for prolonged deficiency leads to scurvy and, ultimately, to death. It is doubtful whether vitamin C has any other therapeutic usefulness than that of preventing and curing scurvy, but unless the complexities of scurvy itself are appreciated, this is a misleading oversimplification.

Sources. Vitamin C appears to be present in all living tissues, but fresh fruits and plants are the best sources. Among the richest sources are black and red currants, strawberries, greens and the citrus fruits. It has been found that the major portion of vitamin C in the orange is located in the peel. Plums, pears and melons contain negligible quantities, while potatoes, spinach, cabbage, water cress and carrots contain relatively large amounts. To most people the potato is an important source of vitamin C. A well-balanced diet containing plenty of vegetables, and some fruit occasionally, will supply the normal requirements of vitamin C, provided that the foods are not spoiled in cooking and that the cooking water is consumed as well.

Human Requirements. The Food and Nutrition Board of the National Research Council recommends 30 mg. per day for infants, from 50 to 75 mg. for children, from 75 to 90 mg. for adolescents, from 70 to 75 mg. for normal adults, 100 mg. for pregnant women and 150 mg. for lactating women. In the field of vitamin nutrition, the principle appears to be widely accepted that generous estimates are best, and this is sensible, for excess vitamin C is readily and rapidly excreted in the urine.

Clinical Use of Vitamin C

The only disease that specifically responds to vitamin C is scurvy, yet its use has been advocated in the treatment of a number of conditions. Therapeutic indications for the use of ascorbic acid include scurvy, early and late, with diagnosis resting on the basis of roentgenologic evidence in the long bones, the blood level of ascorbic acid, and possibly failure to excrete an optimum amount of ascorbic acid in the urine, dental caries, pyorrhea, certain gum infections, anorexia, anemia, undernutrition and infection, when they are the result of a lack of vitamin C.

Ascorbic acid has been tried in a greater variety of disorders than almost any other vitamin.

We will discuss a few of the conditions in which the use of ascorbic acid is still in the experimental stage. Wound healing is now fairly definitely considered to be more satisfactory when the level of ascorbic acid is not below normal. (See Plate 1, showing the experimental study in wound healing in vitamin C depleted human subjects by Wolfer and associates.) Therapeutic doses of it have been recommended both before and after operation, and its use in surgery for this purpose in patients with subnormal level of ascorbic acid has become quite general.

Dental conditions, including sore and bleeding gums, gingivitis, periodontal disease and tooth-extraction wounds, have been found to be accompanied many times by low vitamin C levels in the body. Results from ascorbic-acid therapy have been favorable in some cases and not in others.

The toxic symptoms of lead poisoning have been reported to disappear on ascorbic-acid therapy in certain early studies, but later reports have not confirmed this. Arsenical sensitivity in patients under treatment for syphilis has been overcome in some cases through the use of ascorbic acid, the vitamin apparently acting as a detoxifier of the heavy metal in the drug. Excessive requirements in iron therapy have been reported in patients receiving large amounts of ferrous or ferric salts and during administration of ferrous sulfate in daily doses of six grains or more. Sensitivity to sulfonamides has, in a very few cases, been treated with ascorbic acid with results indicating probable protection.

Infections may predispose to lowered ascorbic-acid levels in the body, as in tuberculosis, scarlet fever and rheumatic fever. Ascorbic-acid therapy has been found to raise the blood and the urine levels, but in studies recently reported it apparently has not had any appreciable influence on the clinical course of these diseases.

Gastric disorders, including peptic and duodenal ulcers, may lead to ascorbic-acid deficiency and require intensive therapy for the prevention of avitaminosis. Contributing factors in such conditions are: (1) Insufficient dietary intake; (2) achlorhydria and the practice of alkalinization, as in peptic ulcer; (3) changes of the intestinal flora to the point where ascorbic-acid-destroying organisms predominate; (4) abnormal bowel movement, as in catharsis, diarrhea and ulcerative colitis.

Hay fever has been treated with vitamin C, but results so far are controversial.

PLATE 1

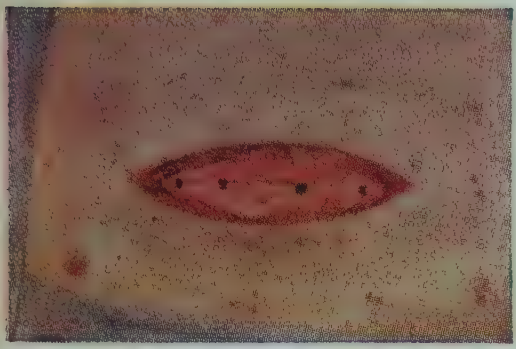


Fig. 1.

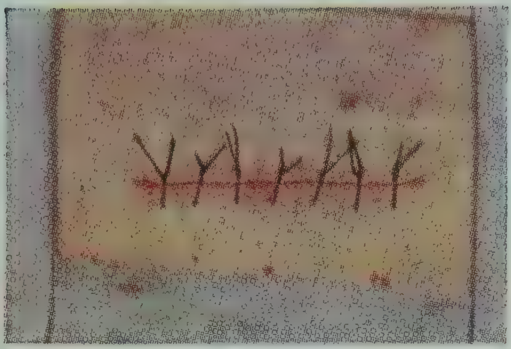
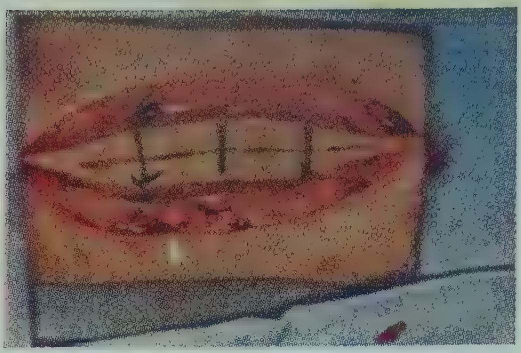


Fig. 2.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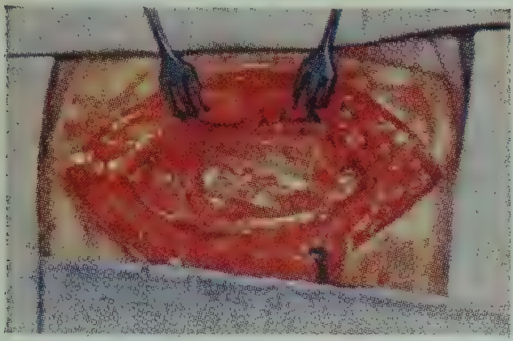
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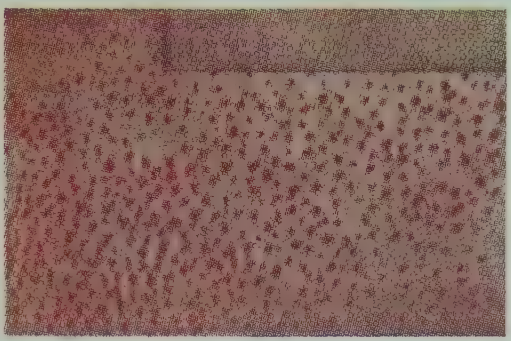


Fig. 5.

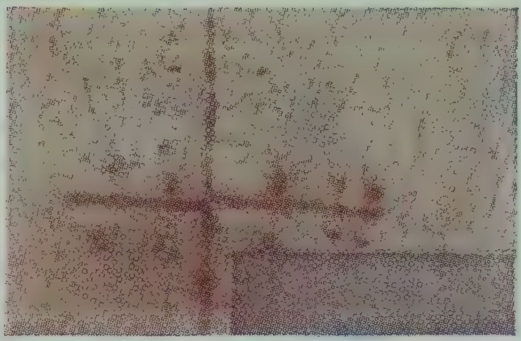
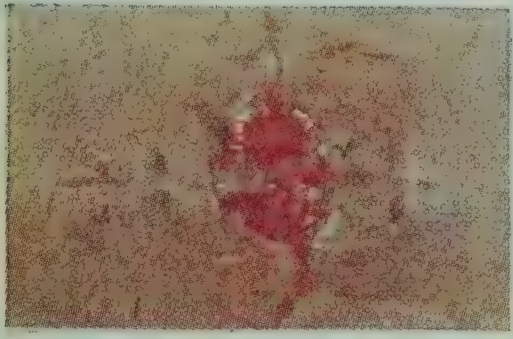


Fig. 6.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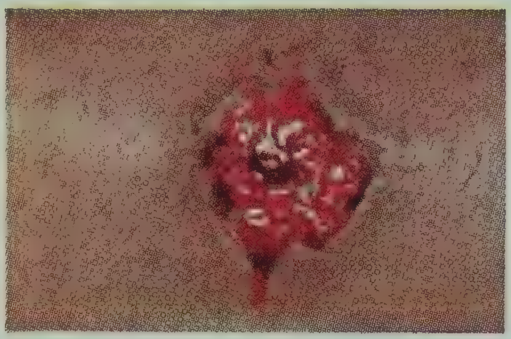
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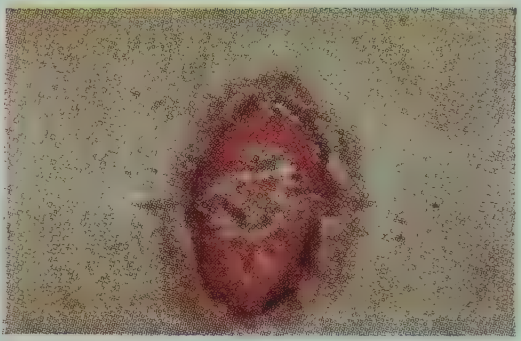
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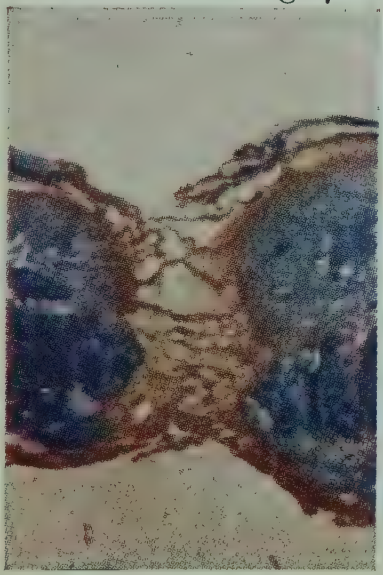
Fig. 10.

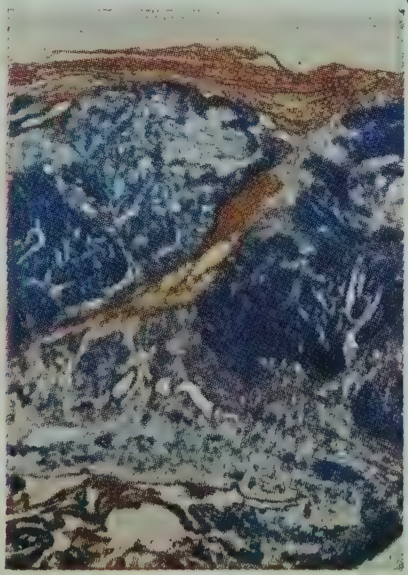
Fig. 11.

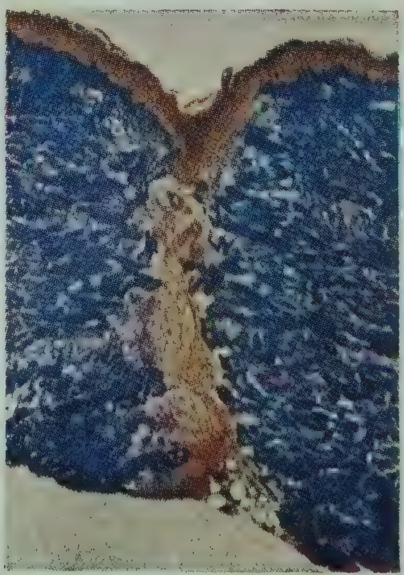
Fig. 12.

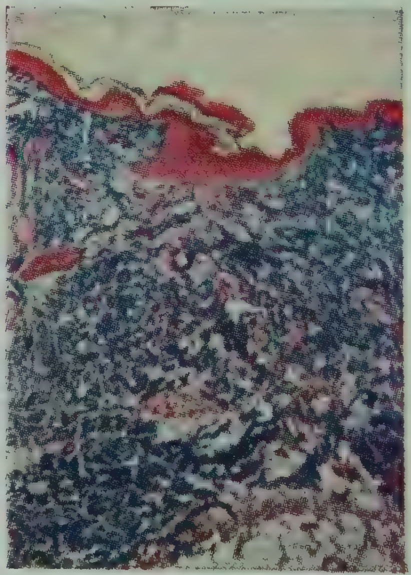
Fig. 13.

An Experimental Study in Wound Healing in Vitamin C Depleted Human Subjects. John A. Wolfer, Chester J. Farmer, Walter W. Carroll and Donald O. Manshardt.

Fig. 1. Skin and fascial incisions with silk sutures in latter.

Fig. 2. Skin incision closed with silk sutures.

Fig. 3. Biopsy of skin wound by elliptical excision.

Fig. 4. Biopsy of fascial wound by rectangular excision *in toto* of healing suture line.

Fig. 5. Perifollicular petechial pigmentation in depleted subject following soap-and-water skin cleansing.

Fig. 6. Primary healing of cruciate skin closure in subject 5 (W.R.).

Fig. 7. Failure of wound healing after cruciate skin closure in depleted subject 1 (D.A.).

Fig. 8. Same in depleted subject 6 (L.M.).

Fig. 9. Same in depleted subject 8 (J.M.).

Fig. 10. Fascial suture line of depleted subject 8 (J.M.) at 11 days. Photomicrograph reveals lack of blue-staining collagen immediately within the healing zone (Zenker-Mallory stain).

Fig. 11. Fascial suture line of control subject 11 (D.G.) at 7 days. Photomicrograph reveals abundant light-blue-staining collagen throughout the suture line.

Fig. 12. Skin suture line of depleted subject 8 (J.M.) at 11 days. Photomicrograph reveals again the lack of collagen throughout the healing zone except for the slight deposition just next to the epithelium.

Fig. 13. Skin suture line of control subject 13 (I.C.) at 10 days. Collagen is to be seen diffusely throughout the suture line.

Other miscellaneous conditions in which ascorbic acid has been tried in isolated studies include prevention of varicose veins in pregnancy, food allergies, methemoglobinemia, hypertension, corneal inflammation, heat cramps and prostration, cardiac decompensation for diuresis and vaginal ulceration.

THIAMINE—B_1

The history of vitamin B_1 is intimately associated with studies on beriberi. The conquest of beriberi started in 1882 when Takaki, head of the Medical Department of the Japanese Navy, practically eradicated the disease among Japanese sailors by supplementing the diet, which consisted mainly of rice, with fish, vegetables, meat and barley. These efforts to control the disease led to the attack on the problem and initiated the series of studies which have led finally to our present knowledge of the disease. It was Funk's efforts to isolate the antineuritic factor associated with beriberi which gave us the name thiamine and started the long series of researches which led to the isolation of thiamine by Jansen and Donath (1921 to 1927) and to its synthesis by Williams and Cline (1936).

Thiamine hydrochloride is a white crystalline substance which is readily soluble in water and possesses a nutlike and salty taste and a yeastlike odor. In foods and in tissues it occurs both in the free form and as thiamine pyrophosphate or co-carboxylase. In the latter form it functions in the living cell as a co-enzyme in carbohydrate metabolism. In a thiamine deficiency the metabolism of carbohydrate is incomplete and pyruvic acid accumulates in the tissues, a condition which is used clinically in determining thiamine insufficiency. Many of the symptoms which have been observed in beriberi may be related to faulty carbohydrate metabolism, although it is still difficult to differentiate an uncomplicated thiamine deficiency from multiple deficiencies. Impairment of this function is apparently responsible for the varied and the widespread disorder seen in beriberi and other forms of vitamin B_1 deficiency. Among the earliest and the most constant of these disorders is anorexia, and with it an impairment of digestion and assimilation. The tone and the motility of the gastro-intestinal tract, as well as its secretive activity, are likewise affected. The most striking change, and among the most constant of the changes which accompany advanced thiamine deficiency, is probably neuritis.

Sources. Vitamin B_1 is widely distributed in raw, untreated foodstuffs, the richest sources being whole cereals, yeast, pork, peas and beans. Actually, there are few common foods that are potent sources, and in planning diets one must rely on several foods to obtain the optimum requirements of the vitamin. In preparing foods for the table, considerable losses in vitamin content may occur through destruction by heat, by solution of the water-soluble vitamin in the cooking water, which may be and usually is thrown away, and by the rejection of bones, vegetable peelings and fruit cores. There are also considerable variations in the time taken to cook food and the method of cooking. The most potent sources of thiamine are pork, liver, kidney, tomatoes, fresh green vegetables, wheat germ, baker's and brewer's yeast, whole-cereal grains and enriched flour. The cereals rank first as the most important source of vitamin B_1 in human diets. Some of the poorest sources are processed cereals, nonenriched flour, beef muscle, fresh peaches and milk.

Human Requirements. The daily allowance of thiamine recommended by the Food and Nutrition Board of the National Research Council is from 1.2 to 2.0 mg. daily for men and from 1.1 to 1.5 mg. for women, the exact amount depending on whether the patient is engaged in sedentary, moderately active or very active work. The daily dose recommended for those under 13 is from 0.4 to 1.2 mg. daily; for those from 13 to 20, from 1.2 to 1.8 mg. daily; for women in the latter half of pregnancy, 1.8 mg. daily; and for lactating women, 2.0 mg. daily.

Clinical Effects of Thiamine Deficiency

Since the mild forms of thiamine deficiency are rather widespread in the United States, because of lack of thiamine in the diet, one should look for the early, mild type of symptoms, such as anorexia, rather than the late, severe manifestations of beriberi. It should be pointed out that the type of symptoms which develop depend to a considerable extent on the rate at which the deficiency develops, but in all cases the subjects become depressed, irritable, quarrelsome, un-co-operative and fearful. It has been stated that peripheral neuritis that involves a single nerve, is not bilateral and symmetrical and does not involve first and predominantly the lower extremities is not due to thiamine deficiency alone. On the other hand the polyneuropathies occurring in association with beriberi, alcoholism, pellagra, pregnancy, cachexia, diabetes, hyperthyroidism and chronic diarrheal diseases are usually a manifestation of thiamine deficiency and generally respond to therapy with that vitamin. Often, however, latent or manifest deficiencies in other vitamins coexist with the thiamine deficiency.

Wernicke's disease occurs most often, but not exclusively, in association with chronic alcoholism. It is characterized clinically by ophthalmoplegia, polyneuropathy, ataxia and progressive clouding of consciousness. It, likewise, is usually associated with multiple vitamin deficiencies.

Cardiac patients often respond to thiamine therapy, but it is in treatment of the cardiac forms of beriberi, when recognized, that the most favorable results may be expected. The reports that roentgen sickness can be successfully treated with thiamine hydrochloride needs further confirmation.

RIBOFLAVIN—B_2 OR G

A water-soluble, yellow-green fluorescent pigment in whey attracted the attention of chemists as early as 1879. The essential features of the syndrome of riboflavin deficiency were described as far back as 1911 by Stannus, whose early work on the subject has not received sufficient recognition. Stannus described the syndrome of riboflavin deficiency some twenty-five years before riboflavin was discovered. He knew that these lesions were the result of dietary deficiency, but beyond that he could not go as the vitamins had not then been differentiated. In 1915, Bahr gave further descriptions of the tongue lesions he had seen in Ceylon. In 1938, Sebrell and Butler published their observations on induced riboflavin deficiency or ariboflavinosis, as they termed it, in man. Certain vitamins of the B complex—thiamine, adenylic acid, riboflavin, nicotinic acid and possibly pyridoxine—are of considerable importance in metabolism. They form part of a complex enzyme system concerned in the oxidation reduction reactions of living cells. Such enzymes consist of a molecule of the vitamin, or a molecule of which the vitamin is part, coupled with a protein carrier, the whole exhibiting enzymic activity or participating in a system which is necessary for the activation of an important enzyme. The need for riboflavin in the diet is probably due to the fact that it is an essential constituent of the flavoprotein in enzyme system, which transports hydrogen from tissue cells to the blood stream, where free oxygen is available from the breakdown of oxyhemoglobin and where the oxidation of the hydrogen, received originally from the substrate, can be accomplished. Riboflavin must be phosphorylated before it can possess vitamin activity.

Sources. Riboflavin is widely distributed in plants which synthesize it and in animal tissues. Among the best sources are yeast, milk, white of egg, fish roe, kidney, liver, heart and growing leafy vegetables. Other fairly good sources are fish, meat and poultry muscle. Grains and legumes, although they contain it, are not particularly rich sources. In green vegetables, the leafy portions and the growing parts contain most riboflavin. Milk, eggs and leafy green vegetables are the chief sources of riboflavin in the average diet. Fresh raw peas and beans are fair sources. Considerable quantities of riboflavin in milk may be destroyed if milk bottles are allowed to stand for any length of time exposed to the sun or bright daylight. There is practically no loss of riboflavin in the pasteurization of milk.

Human Requirements. The daily allowances recommended by the Food and Nutrition Board of the National Research Council are 2.0 mg. for moderately active men, 1.5 mg. for sedentary women, 2.5 mg. for women in the latter half of pregnancy, 3.0 mg. for women in lactation, 0.6 mg. for children under one year, from 0.9 to 1.8 mg. for children from one to twelve years, from 1.8 to 2.5 mg. for adolescents. These are liberal allowances and are probably sufficient to maintain saturation under normal conditions.

Clinical Effects of Deficiency

Riboflavin deficiency is characterized by changes in the tongue, lesions of the lips, lesions of the skin and ocular manifestations. A typical glossitis may be observed often before other signs of riboflavin deficiency are present. The tongue is clean, the papillae are flattened or mushroom-shaped rather than atrophic, as in pellagra, and the color is definitely purplish red or magenta instead of scarlet, as in nicotinic-acid deficiency.

The lips become reddened, then shiny and denuded, with maceration and fissuring at the angles of the mouth (cheilosis).

Frequently seborrheic follicular dermatoses occur at the nasolabial folds, and even over the nose and the forehead.

Ocular manifestations are characterized by itching, burning and a sensation of roughness of the eyes (keratitis), accompanied by mild photophobia. The anatomic changes may vary from superficial invasion of the cornea by capillaries to an extensive vascular proliferation, with or without infiltration, opacity and exudate formation. Symptoms of riboflavin deficiency may be encountered in other diseases, notably pellagra, and in such cases riboflavin administration is indicated. Although the above symptoms may develop from riboflavin deficiency, and will then respond to its administration, recent evidence suggests that they are not necessarily specific and may occur in association with other conditions in the absence of riboflavin deficiency. In such instances they will not improve on riboflavin therapy.

NICOTINIC ACID (NIACIN)

Pellagra has been known in northern Italy since 1700. It was described by Casal of Spain in 1735. The present name of the disease has its origin in Frapolli's description of 1771—pelle agra—meaning rough skin. Goldberger and his associates were the first to demonstrate conclusively in 1912 that pellagra could be prevented by means of an adequate diet. For several years the significance of nicotinic acid in nutrition remained undiscovered. Although it was found in yeast concentrates nearly thirty years ago, little interest was taken in the physiologic role of pyridine derivatives until 1938, when Warburg and his colleagues showed that nicotinamide is the active group of the co-enzyme now known as codehydrogenase II.

In the body, nicotinic acid functions as a component of two co-enzymes—co-enzyme I, or cozymase, and co-enzyme II —which are concerned with both glycolysis and respiration. The structure of the two co-enzymes is similar, differing only in the number of phosphoric-acid molecules. Co-enzyme I is a diphosphopyridinenucleotide and co-enzyme II a triphosphopyridinenucleotide. In nicotinic-acid deficiency it is possible to demonstrate the decreased cozymase content of the liver and muscle tissue. There has been some question about the cozymase content of the blood during deficiency, but all workers are now agreed that the change, if demonstrable, is very slight. It is thus impossible to use this method in the diagnosis of nicotinic-acid deficiency.

A disease of dogs, known as blacktongue, characterized by glossitis, stomatitis, diarrhea and typical skin lesions, bears a close resemblance to human pellagra. Elvehjem tested the effect of nicotinic acid on dogs suffering from blacktongue and it was curative. This suggested its therapeutic use in the treatment of human pellagra. Numerous investigators soon confirmed these findings in cases of human pellagra.

Sources. Nicotinic acid occurs in all living cells. Liver, the adrenals, kidney, yeast, whole-grain products, fresh foods, mushrooms and peanuts are among the best sources. Meat and meat extracts contain appreciable quantities. Denatured cereals such as white flour or polished rice, fruit and vegetables in general and milk are poor sources.

Since nicotinic acid is heat-stable and resistant to oxidation, the action of light, very little is lost in food during cooking and processing. In the cooking of meat, from 80 to 85 per cent is retained after roasting; 77 per cent after frying; and 65 per cent after braising.

Human Requirements. The daily allowance recommended by the Food and Nutrition Board of the National Research Council for a man of 70 Kg. is from 12 to 20 mg.; for a woman of 56 Kg., from 11 to 15 mg.; for the child of school age, from 10 to 12 mg.; and for the pregnant or lactating woman, from 18 to 20 mg.

Clinical Use of Nicotinic Acid

The therapeutic indications for the use of nicotinic acid (niacin) and nicotinamide (niacin amide) include the various symptoms of early pellagra and the more advanced typical pellagra.

Early pellagra is characterized by vague, subjective sensations which are similar to those encountered in most vitamin deficiencies. The clinical picture is one of gradually developing lassitude, anorexia, mental torpor, emotional instability, vague digestive symptoms, weakness and dizziness, sometimes with, but more generally without, loss of weight. In the absence of typical pellagrous lesions, the use of nicotinic acid or amide offers a means of confirming the diagnosis. Other mental symptoms, including particularly stupor in middle-aged or elderly persons and posttraumatic confusional states, have been reported to respond favorably in instances to nicotinic-acid therapy. These may occur in the presence or absence of typical symptoms of pellagra.

Alimentary lesions with burning and redness of the tongue, glossitis, anorexia, diarrhea—all are dramatically improved. Desperately ill patients who would have died before the discovery of nicotinic acid have been restored to health by its use. The first noticeable effect of therapy is on the glossitis, which disappears within twenty-four hours after treatment. The ulcers beneath the tongue and on the lips usually heal in from three to five days. There is a marked relief of soreness and pain in the mouth, and the papillae of the red, beefsteak tongue regenerate in from seven to fourteen days. When the anorexia is uncomplicated by thiamine deficiency it will disappear after a few days' treatment with nicotinic acid. Nausea and vomiting will also disappear after from two to four days. The improvement of the patient's mental symptoms, including hallucinations, delusions and depression, is the most spectacular and dramatic result of the therapy. Often within four or five days after treatment these patients who have been completely disoriented become entirely rational. There is gradual improvement of the skin lesions, which are usually bilateral and symmetrical, appearing most often on the dorsum of the hand, the elbows, the knees, the ankles, the neck, the axilla and the perineal region.

Other conditions which may be associated with nicotinic-acid deficiency must be considered to be still more or less in the experimental stage. Vincent's infection has been treated with nicotinic acid, usually in addition to other therapeutic measures, with varying results. Though it may occur as a secondary infection in sore, pellagrous mouths, it does not necessarily respond to nicotinic acid when unassociated with pellagra. Migraine, Ménière's syndrome, multiple sclerosis and rheumatoid arthritis have been reported to have been benefited in some instances, but in such cases, success, if any, would be due to the vasodilating action of nicotinic acid and not to its use as a vitamin. High-tone deafness has been reported to respond to nicotinic-acid administration in some cases.

PYRIDOXINE—B_6

In 1934, Gyorgyi reported the existence of a factor distinct from the water-soluble factors known at that time, lack of which caused dermatitis or acrodynia in rats. It was called vitamin B_6 and was later shown to be identical to the factor Y of Chick and Copping, the antidermatitis factor of Hogan and Richardson, the vitamin H of Booher, the factor I of Lepkovsky. The vitamin was isolated in 1939 by a number of investigators and the synthesis of vitamin B_6 was effected in 1939 by Harris and Folkers in America and by Kuhn and his coworkers in Heidelberg.

Rats fed on diets deficient in pyridoxine developed cutaneous symptoms characterized by a symmetrical dermatosis affecting first the paws, then the tips of the ears and the nose, which became red, swollen and edematous. The matted fur on the backs of the hind paws desquamated, leaving a denuded, pale-pink, glistening skin. Sometimes there was fissuring or ulceration at the angles of the mouth with a lesion at the tip of the tongue, which might ulcerate. The relationship of vitamin B_6 to some of the unsaturated fatty acids is of interest. Pyridoxine, like riboflavin and nicotinic acid, probably forms part of an oxidation reduction enzyme system in the body.

Sources. Pyridoxine appears to be widely distributed in foods, yeast, liver, cereal polishings, cereals and legumes being particularly good sources. There is an increase in this vitamin in cereals on germination. Fish is a moderately good source. Vegetables and milk contain little pyridoxine. Other fairly good sources are potatoes, roasted peanuts, fresh peas, molasses, dried beans and bananas.

Human Requirements. It has not been shown that pyridoxine is essential for human nutrition, but if it is, the probable requirements calculated from animal data are from 1.5 to 2 mg. daily.

Clinical Effects of Deficiency

Pyridoxine is one of the newer factors of the vitamin B complex. In contrast with thiamine, riboflavin and nicotinic acid, the need of pyridoxine in human nutrition has not been definitely established, and it has not yet had sufficient clinical trials to warrant its recommendation in any particular disorder. Its deficiency leads to acrodynia and retarded growth in the rat, hypochromic anemia in dogs. Pyridoxine has been tried in the following conditions, but its use must be considered to be entirely experimental at present.

Symptoms occurring in pellagra which had not responded to nicotinic acid, thiamine or riboflavin were reported to disappear on the administration of pyridoxine in the original clinical work with this vitamin. These symptoms included extreme nervousness, insomnia, irritability, abdominal pain, weakness, difficulty in walking. Cheilosis has sometimes responded to the administration of pyridoxine when riboflavin gave little or no response. Muscular dystrophy and amyotrophic lateral sclerosis have been treated with pyridoxine alone and in combination with other B complex factors and vitamin E. Improvement was noted in some studies, none in others. Paralysis agitans was treated and encouraging results were reported in some cases. More recent investigations indicate that no improvement, either subjective or objective, can be expected. Acne and seborrheic dermatitis have been reported to respond favorably. Sydenham's chorea and radiation sickness have been treated and good results reported. The nausea and the vomiting of pregnancy are included in the list of conditions which have been favorably influenced by pyridoxine therapy. Granulopenia, caused by thio-uracil and other drugs, has been reported to respond favorably to intensive treatment with pyridoxine.

PANTOTHENIC ACID

The discovery of pantothenic acid had its origin in 1901 in the discovery of bios, a hypothetical substance now known to be a mixture necessary for the reproduction of yeast. In 1930, a pellagra-like dermatitis occurring in chicks on a restricted diet was described, and it was subsequently shown that this could be prevented by feeding pork liver and by a factor in liver extract which was subsequently termed the filtrate factor. Williams found that a naturally occurring compound of unknown composition stimulated the growth of yeast, and to this compound he gave the name pantothenic acid. The identity of the chick antidermatitis factor and pantothenic acid which had been suggested because of their similarity in chemical behavior was confirmed biologically by Jukes and others. In 1940, pantothenic acid was synthesized by several groups of investigators in America, in Switzerland and in Germany. Green plants synthesize pantothenic acid after photosynthesis is first established.

Pantothenic acid is essential for the nutrition of many species of animals. It is not known whether it is essential for human nutrition, although it is assumed to be, since the blood pantothenic-acid level of patients suffering from deficiency diseases, such as pellagra and beriberi, is from 23 to 50 per cent lower than in normal persons; and with a rise in the blood pantothenic acid there is an increase of from 20 to 30 per cent in the riboflavin content of blood. Pantothenic acid is excreted in human sweat. In human beings, pantothenic acid appears to be linked with riboflavin metabolism. Thus, patients with a low level of pantothenic acid in the blood excrete subnormal quantities of riboflavin. There is some evidence that pantothenic acid may be concerned with fat in carbohydrate metabolism and may be a component of enzyme systems concerned with the metabolism of pyruvic acid.

Sources. Pantothenic acid is widely distributed in foodstuffs. Yeast, liver, kidney, wheat bran and peas are the best common sources. Pantothenic acid is synthesized by certain molds, bacteria and green plants; and it also appears to be synthesized in the gut of ruminants. Grains are good sources of pantothenic acid. The vitamin is also essential for the hatching of eggs. Egg production in hens has been found to continue even on a diet deficient in pantothenic acid, but the hatchability of such eggs diminished to nearly zero. Administration of pantothenic acid to hens already receiving an excellent diet, however, has been found to increase the hatchability of the eggs.

Human Requirements. From the cumulative evidence it may safely be assumed that the pantothenic-acid requirements of human beings are in the neighborhood of from 10 to 12 mg. per day, though no exact figure can be cited.

Clinical Effects of Deficiency

The role of pantothenic acid in human nutrition is unknown. Among the effects attributed to pantothenic-acid deficiency in animals are nutritional achromotrichia, dermatitis, ulcers in the intestinal tract, adrenal, renal and testicular lesions and nerve degeneration. The production of nutritional achromotrichia in animals by dietary means and the restoration of color by adding pantothenic acid to the diet led to the hope that it might be effective in the treatment of human gray hair. This was based on a false assumption, because it has never been shown that dietary deficiency is a factor in human grayness. In America, widespread publicity was given to the so-called anti-gray-hair factors of the vitamin B complex and newspaper advertising was employed to sell calcium pantothenate to restore the color of gray hair. Several investigations have shown that pantothenic acid, or its calcium salts, is quite useless for this purpose. It would thus appear that there is no controlled clinical evidence to show that pantothenic acid is effective in the treatment of gray hair in human beings. We may say that pantothenic acid alone or in adequate amounts in B complex preparations has numerous potentialities in medicine. Pantothenic acid, like other B vitamins, is essential to every cell in the body. Deficiency in it, whether from dietary lack or some other cause, may cause pathologic conditions in numerous organs and tissues simultaneously. In animals, the tissues and the organs made pathologic by its deficiency include dermatoses of the skin, depigmentation and alopecia of the hair, ulcers of the stomach and the intestines, anemia, fatty liver, atrophy of the adrenals, hemorrhage and necrosis of the kidneys, myelin degeneration of the sciatic nerve and spinal cord, mottled thymus and myocardial damage.

CHOLINE

A discussion of choline metabolism, in a chapter dealing with the vitamin B complex, needs an introductory explanation, for the acceptance of choline as a member of this group of vitamins may be seriously questioned. Though it is true that choline is water-soluble and that an adequate supply of it is necessary in the diet of experimental animals in order to prevent the development of a variety of deficiency states, it appears, upon critical evaluation of the evidence, that choline is not after all a vitamin.

The importance of choline as a food factor was first suggested several years ago by Best, who showed that in rats the addition of choline to a diet high in fat prevented the deposition of excess fat in the liver. Choline is therefore said to be a lipotropic factor. Betaine, the anhydride of choline, and the amino acid methionine also appear to have a lipotropic action. The exact mechanism of the lipotropic action of choline is unknown, but it is assumed that dietary choline increases the phospholipid content of the liver and this promotes the transport of fatty acids as phospholipids from the liver to other tissues or promotes utilization of fatty acids in the liver itself. It would appear that choline is being continually synthesized in the body in amounts sufficient to maintain choline concentration at a constant level. When choline is lacking in the diet, a process of biologic methylation of suitable nitrogenous precursors serves to maintain normal choline concentration. The methyl groups of the choline structure are derived from the sulfur-containing amino acid methionine and are transferred to compounds like ethanolamine, betaine and glycine. In turn, the methyl groups of choline have been shown to be utilized by the organism in the synthesis of methionine and creatine.

Sources. Liver, egg yolk, nerve tissue, wheat germ and yeast are the best sources, although it is also present in greens and leguminous vegetables.

Clinical Effects of Deficiency of Choline

A diffuse, nodular cirrhosis of the liver occurs in a number of species kept on diets deficient in choline. At the same time hemorrhagic degeneration of the kidneys has been observed, the lesion occurring in the cortex of the organ. Choline is essential not only for the metabolism of neutral fat but for that of cholesterol.

Choline deficiency in animals produces a hemorrhagic tendency. Intra-ocular hemorrhages have been observed. Similarity between the enlarged hemorrhagic kidney and ocular hemorrhages in choline-deficient animals and hypertensive retinopathy in man has been pointed out. The fact that dietary cirrhosis of the liver in experimental animals can be prevented by choline has led to some speculation on the etiology and the treatment of clinical cirrhosis of the liver. Cirrhosis of the liver in rats resembling Laënnec's cirrhosis in man was both prevented and cured by the administration of choline, although, as would be expected, the fibrous tissue persisted. The liver cells regenerated and the gross appearance of the liver improved. Choline will prevent the marked accumulation of liver lipid in animals ingesting a diet high in lipids or high in cholesterol. The liver pathology that develops in experimental animals maintained for relatively long periods of time on a low-protein choline-deficient diet is characterized by cirrhosis and hemorrhage and necrosis. Choline feeding will largely prevent hepatic cirrhosis, but not—at least not uniformly—the necrosis and the hemorrhage. From the variety of experimental evidence establishing physiologic needs for choline, or for groups yielded by choline in metabolism, clinical therapeutic effects of choline may be expected in the future.

INOSITOL

Inositol is a crystalline substance with a sweet taste. It is an extremely stable substance and is resistant to both strong acid and alkali treatment. It occurs in plants as phytin, a calcium magnesium salt of inositol phosphoric acid. Little is known of the role of inositol in animal physiology. It has been suggested that with pantothenic acid it is essential for normal gastro-intestinal function. Martin and his coworkers have shown that dogs kept on a diet deficient in inositol and pantothenic acid showed increased gastric emptying time, with pyloral spasm, marked segmentation of both small and large intestines, gastro-intestinal hypertonicity and hypomotility, ribbon-like segments in the bowel alternating with dilated loops and frequent gas formation. The conclusions were based on x-ray studies. Martin suggests that some of the gastro-intestinal symptoms of deficiency diseases, such as pellagra and sprue, and those produced by experimentally produced vitamin B complex deficiency in man may be due to deficiency of inositol and pantothenic acid. The deficiency of inositol in mice and in rats is stated to cause alopecia, although a deficiency of pantothenic acid appears to be necessary as well. Inositol is also stated to be concerned with the regeneration of hair, in the condition known as spectacle eye (in rats), although this has not been confirmed, and it is essential for lactation in the rat.

Sources. It is a normal constituent of all plants, and animal tissues, fruits cereal, grain, yeast and other molds and bacteria are good sources of inositol. It also occurs in muscle, liver, kidney, blood, milk and eggs. In the cooking of food, from 25 to 50 per cent of inositol is inactivated.

Human Requirements. Human requirements of the vitamin are not known, although the average intake must be greater than that of any other vitamin owing to its presence in such large quantities in plants and in cereal grains. The daily intake is probably about 1 Gm. Certainly the consumption of from 1 to 2 Gm. daily causes no untoward effects.

Clinical Use of Inositol

Vorhaus found that giving from 1 to 2 Gm. daily of inositol had no beneficial effect on human alopecia, although it was effective in certain cases of pruritus. Inositol seems to inhibit tumor growths, according to some investigators. Recent studies have shown that the livers of patients with gastro-intestinal cancer are infiltrated with fat. If these patients are given inositol in doses of 280 mg. before operation, the fat concentration of the liver is found to be within normal limits. In the experimental animal, inositol has been found to have lipotropic effects and prevents the deposition of fat in the liver and other organs.

FOLIC ACID AND/OR L. CASEI FACTOR

Anemia developing as a result of a diet deficient in vitamins has been described in a number of species of animals. Monkeys fed a deficient diet similar to that customarily consumed by the poorer classes in India developed a macrocytic anemia accompanied by leukopenia, granulocytopenia and a megaloblastic hyperplasia of the bone marrow, which could be relieved by feeding marmite (yeast extract). This anemia closely resembles that seen in human cases of nutritional macrocytic anemia. This work has been confirmed and extended by subsequent observers, notably by Day and associates. Monkeys on a deficient diet develop a progressive, fatal disease characterized by anemia, leukopenia, ulceration of the gums, and often diarrhea. This can be prevented by feeding adequate amounts of brewer's yeast or liver extract. To the active substance they applied the term vitamin M. They, together with others, later showed that this effect was not produced by any of the recognized members of the vitamin B complex, including thiamine, riboflavin, niacin, calcium pantothenate, pyridoxine hydrochloride, sodium para-aminobenzoate, choline or inositol.

In 1939, Hogan and Perriott showed that chicks on a special diet adequate in all the essential factors then recognized failed to grow and developed a macrocytic, hyperchromic anemia. This could be prevented, or relieved, by a water-soluble liver extract. They designated the active substance vitamin Bc.

The study of the substance which prevents the development of anemia in these animals has been facilitated and promoted by observations on the growth requirements of certain bacteria. In 1940, Snell and Peterson reported that on a basal medium consisting of hydrolyzed casein, tryptophan and several of the then known members of the vitamin B_2 complex, no growth of Lactobacillus casei would occur unless extracts of certain plant or animal tissues were added to the medium. Yeast and liver contain this growth factor (L. casei factor) in relative abundance. They were able to remove the active material from these extracts and obtain it in a state of relative purity and high concentration.

In 1941, Mitchell, Snell and Williams obtained from spinach a similar factor which stimulated the growth of Streptococcus lactis R (S. lactis factor), for which they suggested the name folic acid, because of the source of the material. This also stimulated the growth of Lactobacillus casei with about the same degree of potency. Angier *et al* have synthesized a compound which appears to be identical in its physiologic action in chicks and in its important physical and chemical properties to the crystalline Lactobacillus casei factor (folic acid) isolated from liver. Folic acid appears to be identical in its physiologic action to vitamin M in monkeys and to vitamin Bc in chicks.

Sources. Folic acid, so called because it occurs in green leaves, is also present in animal tissues such as liver and kidney and in mushrooms and yeast, green vegetables and green peas.

Human Requirements. Spies states that marked responses have been obtained in some cases with as little as 10 mg. per day by mouth and from 5 to 10 mg. parenterally. The minimal effective dose and the optimal dose have not been determined, but 400 mg. per day have been given orally without bad effects. The daily suggested dosage is 20 mg. by mouth or parenterally.

Clinical Use of Folic Acid

The effectiveness of Lactobacillus casei factor in curing nutritional macrocytic anemia in monkeys led naturally to a trial in similar anemias in man. Vilter, Spies and Koch in 1945 reported the treatment of macrocytic anemia with L. casei factor using the synthetic folic acid. The drug was administered both orally and parenterally, usually in an oral dose of 50 mg. twice a day, or parenterally 20 mg. a day. Highly satisfactory results were obtained. A reticulocytosis ranging from 6 to 21 per cent appeared, reaching the peak from the fourth to the tenth day. This was accompanied and followed by a progressive rise in red blood cells and hemoglobin, which reached normal in cases in which treatment was continued. In most of the cases with a leukopenia, the leukocytes also rose to normal figures. There was a corresponding improvement in clinical symptoms, usually evidenced subjectively from the third to the fifth day. The patients felt better and stronger. Appetite returned and there was a gain in weight. In some cases diarrhea, when present, ceased, and there was relief from burning of the tongue and the oral mucous membranes.

Amill and Wright also have reported the successful treatment of unselected cases of pernicious anemia with synthetic L. casei factor.

Highly satisfactory results have also been obtained in treatment of sprue. The hematopoietic response in these cases was quite like that in the other types of macrocytic anemia. There was a reticulocytosis, also a progressive rise in hemoglobin and in red blood cells, and the marrow reverted to a normoblastic type of hyperplasia. There was a corresponding improvement in subjective symptoms with an increased appetite, gain in weight and in strength, and increase in vigor and in alertness. The burning and the objective evidences of glossitis subsided. In most cases the diarrhea largely or entirely subsided and the feces tended to return to normal in bulk and in gross appearance.

The mechanism of the action of folic acid and its relation to other known hematopoietic factors have not been demonstrated. It does not affect the blood of normal individuals. The part that folic acid will take in practical therapeutics is still uncertain, particularly the extent to which it may supplant the use of liver extracts. It is not yet certain that folic acid is fully equal to liver extract in maintaining remissions, and particularly in preventing the development of neurologic degeneration in pernicious anemia. Folic acid was without effect in cases studied of aplastic anemia, iron-deficiency anemia and anemia due to leukemia. In a summary of most recent clinical experience, the statement has been made that synthetic folic acid has a striking antianemic effect in five types of macrocytic anemia, pernicious anemia, nutritional macrocytic anemia, and the macrocytic anemia of sprue, pellegra and pregnancy.

BIOTIN

The discovery of biotin, also known as vitamin H and co-enzyme R, had its origin in the casual observation of Bateman in 1916 that a high concentration of egg white in experimental diets is toxic. Some ten years later, certain foods, notably liver and yeast, were discovered to contain an organic substance capable of protecting rats against the toxic effects of egg white or egg-white injury.

Biotin is necessary for the growth of many bacteria; for example, staphylococcal strains of clostridium, yeasts and fungi. The vitamin appears to be related to the fundamental process of growth. The biotin content of embryo tissues and tumor tissue is very high, but its significance in human nutrition has not yet been elucidated. Biotin has been called the anti-egg-white-injury factor, since avidin, which is present in raw egg white, inactivates biotin, producing deficiency symptoms in the animals. These include a spectacled-eye condition, dermatitis and spastic paralysis in rats.

Sources. Biotin is found in foodstuffs containing other members of the vitamin B complex, particularly yeast, liver, kidney, light chicken meat, eggs, peas, cocoa and cereals. An increase of the biotin content of cereals occurs on germination. Biotin is present in most foodstuffs in a bound form, from which it is liberated in the intestines by enzymic hydrolysis.

Clinical Effects of Deficiency

There is very little in the literature on the relation of biotin to human nutrition and of its value as a therapeutic agent. Two attempts to produce deficiencies in cancer patients were unsuccessful. Sydenstriker and coworkers, in 1942, feeding a diet poor in biotin with large quantities of egg white were able to bring about experimental deficiency symptoms of dermatitis, ashy pallor of the skin, tongue changes, depression, muscle pain and anorexia in four normal patients. Williams, in 1943, reported a case showing exfoliating dermatitis, due presumably to a biotin deficiency. Urinary-excretion studies have helped to provide evidence that this factor is synthesized in the intestine of man.

PARA-AMINOBENZOIC ACID

Ansbacher has shown that para-aminobenzoic acid is a vitamin, since it is necessary for the normal pigmentation of the rat and is a growth-promoting factor for the chick. It is also a factor in lactation of the rat. The vitamin is widely distributed over the entire plant and animal kingdom.

It is an essential metabolite for bacteria. Bacteriostatic action of the sulfonamides is considered to depend upon the close similarity in structure between them (which are derivatives of the sulfanilamides) and para-aminobenzoic acid. It is believed that the sulfonamides are taken up by the bacterial enzyme system which normally uses para-aminobenzoic acid. The enzyme system then becomes blocked and incapable of normal function, with the resulting interference in the reproduction of the bacteria, which then become a prey to the defense mechanism of the body. The enzyme system has a greater affinity for para-aminobenzoic acid than for the sulfonamides, which, to be effective, must be in a much greater concentration. Thus sixteen hundred parts of sulfonamides are necessary to compete with one part of para-aminobenzoic acid. Conversely, para-aminobenzoic acid in sufficient concentration can annul the bacteriostatic effect of the sulfonamides in vitro and in vivo.

From animal experimentation and a limited number of clinical cases, it is indicated that para-aminobenzoic acid may have a beneficial effect on rickettsial diseases such as scrub typhus fever and Rocky Mountain spotted fever.

Clinical interest has centered in para-aminobenzoic acid because of its supposed relation to gray hair. A rather premature claim was made in 1941 by Sieve

WATER-SOLUBLE VITAMINS
ASCORBIC ACID C

Functions in the Body

Protects body from scurvy.
Required for normal tooth formation and maintenance.
Assists in formation of healthy gums.
Required for proper metabolism of the bones.
Maintains proper condition of intercellular substance.
Prevents capillary fragility.

Clinical Features of Deficiencies or Absences

Scurvy (Early and Latent):
- Hemorrhages (mucous membrane, skin, joints, limbs and bone marrow)
- Spongy and bleeding gums (ulcerations)
- Bleeding muscles and tissues
- Pains and swelling in joints and in limbs
- Fragility of bones (spontaneous fractures)

Decalcification of bones.
Decay of teeth.
Loosening and shedding of teeth.

Relative Distribution of Vitamin C in a Few Common Foods

Most Potent		Excellent		Good	
Plant	Animal	Plant	Animal	Plant	Animal
VEGETABLES Cabbage, raw Spinach, raw Tomatoes Tomato juice Peppers, green FRUITS Lemons Oranges Grapefruit Egyptian limes, fresh Black currants Papayas Red currants	(Animal sources as a class are practically devoid of vitamin C)	VEGETABLES Celery Rhubarb Turnips Peas Spinach, cooked FRUITS Citron juice Lime juice Peaches Pineapple juice Raspberries Strawberries Tangerines		VEGETABLES Beans, cooked Beets Cabbage, cooked Carrots Cauliflower Collards Cucumbers Endives Lettuce Onions Potatoes Pumpkins Spinach, cooked Sweet corn Turnip greens Water cress FRUITS Apples Bananas Grapes Grape juice Pears Watermelons	Milk (variable)

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Moderately active man	75 mg.	Moderately active woman	70 mg.
Children up to 12 years	30– 75 mg.	Pregnancy (latter half)	100 mg.
Children over 12 years	80–100 mg.	Lactation	150 mg.

Daily Therapeutic Dosage

Infants 30–50 mg.
Adults up to 1,000 mg., according to symptoms and response.

WATER-SOLUBLE VITAMINS
VITAMIN B COMPLEX COMPONENTS

THIAMINE B_1

Functions in the Body

Furnishes a stimulus to appetite and digestion.
Promotes growth by stimulating metabolic processes.
Protects body from nerve disease (beriberi, polyneuritis).
Influences reproduction and lactation.
Promotes tonicity of the digestive tract.
In form of thiamine pyrophosphate (co-carboxylase) as a co-enzyme in carbohydrate metabolism.

Clinical Features of Deficiencies or Absences

Impairment or loss of appetite, which may result in loss of weight, fatigue, abnormal temperature, etc.
Disturbed digestive processes (decreased motility of the stomach, atonic intestines, etc.)
Impaired growth of young in lactation period (due to deficiency in mother's milk).
May produce amenorrhea.
Beriberi or polyneuritis (nerve disease):
    Loss of co-ordinating powers of muscles
    Gradual paralysis of limbs
    Alimentary disturbances (indigestion, constipation, colitis)
    Emaciation
Neuritis of the alcoholic.
Neuritis of pregnancy.
Cardiovascular symptoms of B_1 hypovitaminosis

Relative Distribution of Vitamin B_1 in a Few Common Foods

Most Potent		Excellent		Good		
Plant	Animal	Plant	Animal	Plant		Animal
Yeast, brewer's	Pork Liver Kidney	Cereals (whole-wheat, corn, rice, oats, etc.) Peas, dried Wheat bran Wheat germ Red Riding beans Soybeans Lentils	Egg (yolk)	VEGETABLES Asparagus Beans Cabbage Carrots Cauliflower Celery Collards Lettuce Onions	Parsnips Potatoes Spinach Tomatoes Turnips Turnip greens Water cress	Brain Cheese Fish roe Milk Oyster (raw)
				FRUITS Apples Bananas Cantaloupes Dates Grapes Grapefruit Lemons	Nuts Oranges Peaches Pineapples Prunes Strawberries	

Recommended Daily Allowances
(Food and Nutrition Board of the National Research Council)

Moderately active man	1.5 mg.	Moderately active woman	1.2 mg.
Children up to 12 years	0.4–1.2 mg.	Pregnancy	1.8 mg.
Children over 12 years	1.3–1.8 mg.	Lactation	2.0 mg.

Daily Therapeutic Dosage

From 50 to 100 mg., according to needs of patient.

WATER-SOLUBLE VITAMINS
VITAMIN B COMPLEX COMPONENTS

RIBOFLAVIN B_2 or G

Functions in the Body

As a constituent of flavoproteins, functioning as important enzymes in tissue respiration.

Clinical Features of Deficiencies or Absences

Ariboflavinosis:
- Cheilosis—fissures in angle of mouth
- Scaliness of lips
- Changes of tongue—magenta color
- Seborrheic skin changes—ears, nose, axilla or groin
- Ocular lesions—photophobia, conjunctivitis, blurring of vision, burning sensation

Relative Distribution of Riboflavin in a Few Common Foods

Most Potent		Excellent		Good	
Plant	Animal	Plant	Animal	Plant	Animal
Yeast Alfalfa	Liver Heart Brain Kidney Milk Egg white	Cereals Peanuts Broccoli Beans, dried Soybeans	Cheese Salmon Trout Sardines	Pecans Almonds Beets Mushrooms Peas Potatoes Cauliflower Celery Avocados Bananas	Oyster Lobster Bacon

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Moderately active man	2.0 mg.	Moderately active woman	1.6 mg.
Children up to 12 years	0.6–1.8 mg.	Pregnancy (latter half)	2.5 mg.
Children over 12 years	2.0–2.5 mg.	Lactation	3.0 mg.

Daily Therapeutic Dosage

From 10 to 30 mg., according to needs of patient.

WATER-SOLUBLE VITAMINS
VITAMIN B COMPLEX COMPONENTS

NICOTINIC ACID (NIACIN)

Functions in the Body

Prevents pellagra.
As a component of co-enzymes concerned in glycolysis and respiration.

Clinical Features of Deficiencies or Absences

Pellagra:
- Alimentary disturbances
- Dermatitis
- Pigmentation and thickening of the skin
- Soreness and inflammation of tongue and mouth
- Diarrhea
- Nervous and mental disorders

Pellagra-like conditions.

Relative Distribution of Nicotinic Acid in a Few Common Foods

Most Potent		Excellent		Good	
Plant	Animal	Plant	Animal	Plant	Animal
Yeast, brewer's Peanuts Whole-grain products Mushrooms	Glandular organs liver kidney spleen adrenals Lean meat beef pork	Beet greens Kale Potatoes Spinach Turnip greens Water cress Wheat germ Peas, dried	Salmon Milk, dry Halibut	Bananas Beets Cabbage Carrots Cauliflower Pears Lettuce Onions Tomatoes Turnips Wheat bran	

Recommended Daily Allowances
(Food and Nutrition Board of the National Research Council)

Moderately active man	15 mg.	Moderately active woman	12 mg.
Children up to 12 years	4–12 mg.	Pregnancy (latter half)	18 mg.
Children over 12 years	13–18 mg.	Lactation	20 mg.

Daily Therapeutic Dosage

Up to 500 mg. in divided doses.

WATER-SOLUBLE VITAMINS
VITAMIN B COMPLEX COMPONENTS

PYRIDOXINE B_6

Functions in the Body

Mechanism of function is unknown.
May be related to enzyme systems and fat metabolism.

Clinical Features of Deficiencies or Absences in Animals

Dermatitis in the rat.
Retarded growth; depressed appetite in the chick.
Hypochromic, microcytic anemia in dogs.
Acrodynia, swelling and denuding of paws.

Relative Distribution of Pyridoxine in a Few Common Foods

Most Potent		Excellent		Good	
Plant	Animal	Plant	Animal	Plant	Animal
Yeast		Beets	Beef	Apples	Veal
Whole wheat		Cabbage	Liver	Cauliflower	Cheese
Potatoes		Carrots	Heart	Corn meal	Eggs
Peanuts		Turnips	Chicken breast	Grapefruit	Lamb leg
Peas, dried			Halibut	Onions	Milk, dried
Molasses				Oranges	Oyster
Beans, dried				Spinach	Salmon
Bananas				Tomatoes	

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)
Need not established (Possibly 2 mg. are ingested in average diet).

Daily Therapeutic Dosage

From 50 to 100 mg., according to symptoms and response.

WATER-SOLUBLE VITAMINS
VITAMIN B COMPLEX COMPONENTS

PANTOTHENIC ACID

Functions in the Body

Mechanism of function is unknown.

Clinical Features of Deficiencies or Absences in Animals

Dermatitis in the chick.
Achromotrichia.
Ulcers in the intestinal tract.
Adrenal, renal and testicular lesions.
Nerve degeneration.

Relative Distribution of Pantothenic Acid in a Few Common Foods

Most potent		Excellent		Good	
Plant	Animal	Plant	Animal	Plant	Animal
Yeast	Beef liver	Bananas, dried	Cheese	Turnips	Veal
Whole bran		Beans	Chicken	Spinach	Halibut
Soybeans		Bread	Eggs	Raisins	
Roasted peanuts		Cabbage	Lamb	Prunes	
Peas, dried		Cauliflower	Milk	Pineapple	
Oats		Maize	Mutton	Peaches	
Mushrooms		Oranges	Oyster	Lettuce	
Broccoli		Potatoes	Pork	Grapefruit	
Barley		Strawberries	Salmon	Carrots	
		Tomatoes	Sardines	Apples	
				Asparagus	

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Need not established (possibly 10–12 mg. per day).

Daily Therapeutic Dosage

Undetermined.

WATER-SOLUBLE VITAMINS
VITAMIN B COMPLEX COMPONENTS

FOLIC ACID and/or L. CASEI FACTOR

Functions in the Body

Fundamental role in blood formation.
Related to nutritional cytopenia.

Clinical Features of Deficiencies or Absences

Macrocytic anemia of sprue, pellagra and pregnancy.
Pernicious anemia.
Nutritional macrocytic anemia

Relative Distribution of Folic Acid in a Few Common Foods

Liver
Yeast
Cereal grains (wheat, malt sprouts, oats, ground corn, polished rice, rice bran, linseed meal, alfalfa meal, soybean meal)
Fish meal
Grass juice
Spinach
Egg white and yolk
Bone marrow
Meat scraps
Milk powder
Whey

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Needs not established.

Daily Therapeutic Dosage

Undetermined.
Minimum dosage 10 mg. Spies suggests 20 mg. daily parenterally or by mouth. 400 mg. daily by mouth have been given with no bad effects.

WATER-SOLUBLE VITAMINS
VITAMIN B COMPLEX COMPONENTS

CHOLINE*

Functions in the Body

Lipotropic factor.
Related to metabolism and distribution of fat.
Basic constituent of lecithin.

Clinical Features of Deficiencies or Absences in Animals

Nodular cirrhosis of liver.
Hemorrhagic degeneration of kidneys.
Essential for metabolism of fat and cholesterol.
Reduction of phagocytic activity.
Slipped tendon in chicks and in turkeys.
Essential for egg production.

Relative Distribution of Choline in a Few Common Foods

Beef liver, dried
Pork liver, dried
White wheat flour
Polished rice
Dried milk powder (skimmed milk)
Commercial casein
Brewer's yeast, dried

Fresh turnips
Soybean meal
Cornstarch
Cheddar cheese
Butter
Tomato juice
Egg white
Peanut meal

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Need not established. Possibly as much as 1 Gm. daily.

Daily Therapeutic Dosage

Up to 6 Gm., according to symptoms and response.

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* Choline may later be classed as a nutritional factor in its own right and not as a vitamin or member of the vitamin B complex.

WATER-SOLUBLE VITAMINS
VITAMIN B COMPLEX COMPONENTS

INOSITOL

Functions in the Body

Lipotropic factor.
May be related to fat metabolism.

Clinical Features of Deficiencies or Absences in Animals

Alopecia in mice and in rats.
Spectacled eyes in rats.
Concerned with intestinal motility in dogs.
Inhibition of tumor growth.

Relative Distribution of Inositol in a Few Common Foods

Rice bran
Heart
Brain
Oranges
Cereal grains
Yeast
Fresh fruits
Fresh vegetables
Liver
Kidney
Milk
Eggs

Recommended Daily Allowances

(Food and Nutrition Board of the National Research Council)

Need not established.

Daily Therapeutic Dosage

Undetermined.

that para-aminobenzoic acid was effective in the treatment of human gray hair, particularly in younger middle-aged persons, in whom the grayness was premature. Unfortunately, much publicity was given to anti-gray-hair factors in the nonmedical press. After much careful investigation it would appear that there is no evidence that human gray hair is due to a nutritional deficiency; nor is there any controlled evidence that any of the B vitamins can restore the natural color or darken gray hair.

A warning is also necessary against the continuous ingestion of large and unphysiologic doses of para-aminobenzoic acid. Although the toxicity factor is low, a high blood level of the substance would render sulfonamide therapy ineffective should the patient suffer from an acute infection normally amenable to treatment with sulfonamides.

Vitamin P

The existence of vitamin P was postulated in 1936 by Szent-Gyorgyi and his coworkers, who claimed that extracts of Hungarian red pepper and lemon juice contained a substance which was more effective in the clinical treatment of increased vascular permeability than vitamin C. Later it was reported that fractionization of these extracts yielded an active preparation consisting of a flavone or flavone glucoside which was called citrin or vitamin P. Efforts to repeat the observation of Szent-Gyorgyi and his coworkers in experimental animals have yielded conflicting results.

The chemistry of vitamin P was investigated by Szent-Gyorgyi, who considered that it consisted of mixed crystals of two related flavone dyes, the glycoside hesperidin and the glycoside of eriodictyol.

Sources. Generally speaking, fruits appear to be the richest source of vitamin P, followed by green leaves.

CLINICAL USE OF VITAMIN P

A number of clinical studies suggest that vitamin P is an essential factor in human nutrition. Various vitamin P preparations have been used clinically: Citrin, in doses of from 20 to 60 mg. daily, either orally or parenterally; hesperidin, from 0.25 Gm. intravenously to 1.0 Gm. a day orally; and calcium eriodictyol, 25 mg. Vitamin P has been used in the treatment of psoriasis. At the moment it must be admitted that evidence for the clinical value of vitamin P in the absence of a deficiency of the vitamin is very scanty. A deficiency of the vitamin, however, is not the only circumstance in which a decreased capillary resistance is found; nor has it been established that any form of purpura is primarily due to an increased fragility of the capillary walls. Many of the clinical studies, particularly those on hemorrhage and purpura, are open to criticism on the ground that they are conditions which may show improvement or spontaneous remission in the absence of any form of therapy.

SUFFICIENT CALORIES FOR ENERGY REQUIREMENTS

Sufficient calories for energy requirements of the body are supplied by foods which contain:

Carbohydrates, mostly vegetable in origin, sugar, starches, cereals and fruits.

Protein, mostly animal in origin, meat, fish, eggs, milk and cheese.

Fat, partly vegetable, such as olive oil and cottonseed oil, and animal, such as butter and lard.

A full appreciation of the importance of the caloric values of foodstuffs dates back to Rubner. Actual determinations in the calorimeter vary considerably, but for clinical purposes, considering materials actually absorbed and utilized, we can use the caloric value of four calories for each gram of carbohydrate and protein and nine calories for each gram of fat.

The number of calories necessary for energy requirement for the normal healthy adult depends upon the height, the weight, the age, the sex and the physical activities of each individual. The basal rate of energy metabolism is the amount needed when the body is at complete physical and mental rest, from twelve to eighteen hours after the last intake of food. It is generally computed on the basis of body surface (calories produced per hour per square meter of body surface), determined either by means of direct measurement of the heat given off in a calorimeter or indirectly by calculation as is commonly done from the quantities of oxygen absorbed and the carbon dioxide excreted by the subject over a short interval of time. This basal rate is used as a starting point for the calculation of total energy requirement.

Caloric Requirements. In estimating the caloric requirement of the diet, Lusk states that the average maintenance for adults approximates from about 35.5 to 36.6 calories per kilogram of body weight. It is well known that the requirements for a child are considerably higher than for an adult. For practical clinical purposes, the total caloric requirement per day for individuals of moderate activity may be estimated by simply multiplying the weight in pounds by 16 for adults, and the weight in pounds by 25 for children, using the standard weight charts (p. 691) for determining the average weight for a given height, age and sex.

There are many gaps in our knowledge of the calories required by individuals for the performance of their daily tasks. Burnet and Ackroyd, reporting for the technical commission appointed by the health committee of the League of Nations in 1935, suggested an allowance of 2,400 calories per day as adequate to meet the requirements of an adult male or female living an ordinary everyday life in a temperate climate and not engaged in manual labor, with the following supplements for muscular activity: Light work, up to 50 calories per hour of work; moderate work, from 50 to 100 calories per hour of work; hard work, from 100 to 200 calories per hour of work; and very hard work, 200 calories and over per hour of work.

Estimates of the energy required in the performance of various occupations and activities have been studied by several investigators. The results of these investigations to show the energy required in the performance of certain occupations, calcluated on an eight-hour working day, are listed in Table 3. Calories listed to meet the energy required for the

TABLE 3

Caloric Requirements for Various Activities, Calculated on an Eight-hour Working Day* (Orr and Leitch)

	OCCUPATIONS	CALORIES
Kestner	Sewing	120
	Writing	120
	Dusting	880
	Mental work	60
	Carpentry	1440
	Stonemasonry	2640
	Sawing wood	3360
	Sweeping	880
Rose (Sherman)	Ironing	472
	Dishwashing	472
	Tailoring	400
	Typewriting rapidly	440
	Bookbinding	680
	Shoemaking	760
	Carpentry	
	Metalworking	
	Industrial painting	1240
	Stoneworking	2520
	Sawing wood	3160
Farkas and Geldrich	Tailoring	640
	Shoemaking	656
	Locksmithing (light work)	936
	Riveting	2202
Becker and Hamalainen	Tailoring	352
	Bookbinding	648
	Shoemaking	720
	Metalworking	1128
	Painting	1160
	Carpentry	1120
	Stonemasonry	2424
	Woodcutting	3104
	Sewing	
	(by machine)	320
	(by hand)	48
	Laundering	1352
Moss	Coal mining (av. for shift)	2560
Kestner and Knipping	Writing	160
	Typing	224
	Sewing	200
	Lithographing	360
	Housepainting	1280
	Drawing (standing)	360
	Violin playing	368

* The amounts mentioned in the table must be added to the calories required for ordinary everyday living in order to arrive at the daily energy expenditure.

performance of the various occupations should be added to the calories required for ordinary everyday life in order to arrive at the total daily energy expenditure.

Various estimates have been made of the average total energy requirements, ranging from 2,400 to 4,000 calories per day. In the present machine age, with consequent less hard physical exertion, the average daily caloric requirement is much less.

WATER

Sources. The water in the body is derived from three sources: (1) From the fluids taken (water, beverages, milk, tea, coffee or soup) ; (2) from the water contained in solid foods; and (3) from the water produced in the body as a result of the oxidative processes of metabolism.

The functions of water are based primarily upon its usefulness as a solvent. It aids the digestive fluids in the absorption of food. It is a valuable adjunct in transporting soluble substances in the blood and the lymph. It aids in the excretion of soluble waste products of the body. Water keeps the materials in the tissues in solution so that chemical reactions can take place, and it also maintains the proper dilution of salts in the tissues. The body temperature is regulated by water. Removal of excess heat is accomplished by evaporation of water from the body surface.

Excretion. Water is excreted from the body by the kidneys in urine, by the lungs as water vapor in the expired air and by the skin as sensible and insensible perspiration.

We suggest that from six to eight glasses of water be taken daily. This amount is variable, depending upon the fluids ingested from other sources, as well as the activity of the individual and the temperature of the environment. There is no objection to drinking water with meals, provided it is not used to wash the food down mechanically. Large quantities of ice water inhibit digestion and are to be avoided.

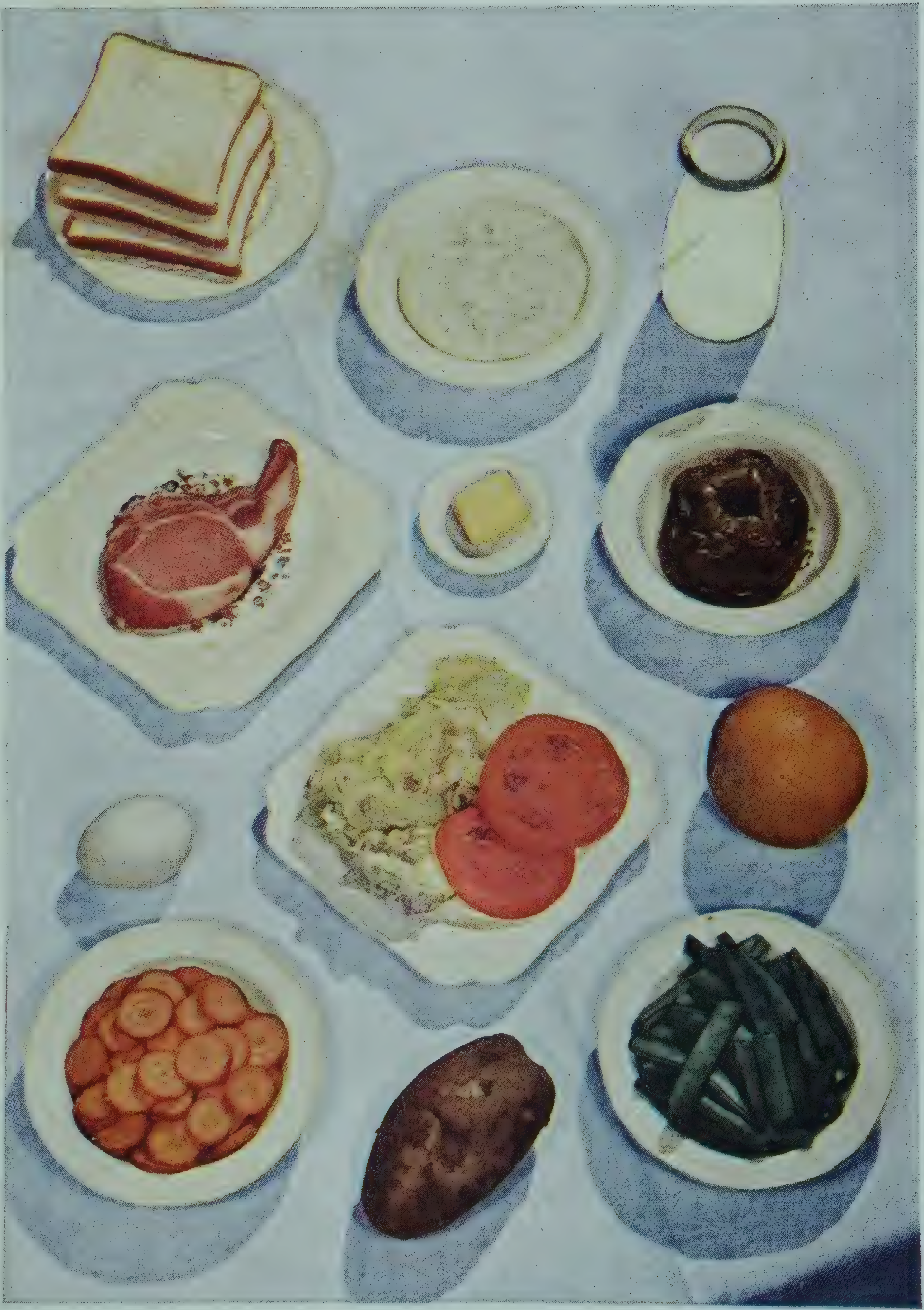
THE ESSENTIAL REQUIREMENTS FOR ALL DIETS

The essential requirements all diets must possess in order to be adequate and protective to maintain health have just been discussed briefly. In Plate 2 are presented foods, including the protective ones, that serve as a basis to meet essential requirements. These foods should serve as a basis for all diets, and if used in the amounts suggested will be protective and meet all minimum requirements, except calories. The analysis of their content is in Table 4. They will average approximately 140 Gm. of carbohydrate, 60 Gm. of protein, 50 Gm. of fat and 1,270 calories. The vitamin content will average approximately 6,000 international units of vitamin A, 1.1 mg. of thiamine, 1.8 mg. of riboflavin, 10 mg. of nicotinic acid and 88.5 mg. of ascorbic acid. The mineral content will average approximately .86 Gm. of calcium, 1.12 Gm. of phosphorus and about 12 mg. of iron.

Any additional foods may be chosen to make up the caloric need, depending upon the individual case, and the diet will provide in adequate amounts all the essential requirements included in the recommended dietary allowances compiled by the Food and Nutrition Board of the National Research Council. (See appendix, pp. 710 and 711.)

A yardstick by which to measure progress toward the goal of good nutrition has long been needed. The term recommended allowances rather than standards

PLATE 2



Foods that serve as a basis to meet essential requirements: milk, 1 pint; egg, 1; vegetables, 3 large servings besides potato (one a green leafy vegetable); fruit, 2 servings (1 raw); meat, fish, fowl, 1 serving (2½ oz.); butter, 1½ squares (15 Gm.); bread, whole-grain or enriched, 3 slices (90 Gm.); cereal, whole-grain or enriched, ½ cup (20 Gm.).

TABLE 4

Analysis of Foods That Serve as a Basis to Meet Essential Requirements

Daily Food Intake	*Quantity*		*Food Stuffs*				*Vitamins*					*Minerals*		
	WEIGHT GM.	APPROXIMATE MEASURE	CARBO-HY-DRATES GM.	PROTEIN GM.	FAT GM.	CALORIES	A. I.U.	THIAMINE MG.	RIBOFLAVIN MG.	NIACIN MG.	ASCORBIC ACID MG.	CALCIUM GM.	PHOS-PHORUS GM.	IRON MG.
Milk	480	2 cups	24	17	18	320	820	0.20	0.86	0.6	4	.56	.44	0.4
Egg	50	1 med.		6.5	6	80	495	0.07	0.18			.03	.10	1.4
Meat (lean)	75	2½ oz.		19	11	160	2106	0.21	0.28	4.4	1.5	.011	.202	3.1
Butter	15	3 tsp.			12	108	480					.003	.003	.03
Vegetables 3%	200	2 servings	6	2.5		60	1080	0.12	0.14	0.4	16	.114	.082	2.0
Vegetables 6%	100	1 serving	6	1		30	480	0.06	0.12	0.4	13	.03	.03	.4
Fruit 10%	100	1 serving	10	1		44	180	0.07	0.03	0.2	42	.028	.022	.4
Fruit 15%	100	1 serving	15	1		64	585	0.05	0.02	0.6	4	.027	.027	.6
Potato	100	1 small	20	2		84	35	0.08	0.03	1.0	8	.014	.058	.85
Cereal, whole-grain or enriched	20	½ cup	15	2.5	1	80		0.06	0.04	0.6		.011	.04	.6
Bread, whole-grain or enriched	90	3 slices	45	7.5	3	240		0.18	0.12	1.8		.039	.12	1.8
Totals			141	60	51	1270	6261	1.10	1.82	10.0	88.5	.867	1.124	11.58

was adopted by the Food and Nutrition Board of the National Research Council.

Some confusion may result from a misunderstanding and a misuse of the recommended dietary allowances.

For example, it would be a misuse to assume that the failure of a diet to meet these standards means that the diet is necessarily inadequate. In setting up the recommended dietary allowances, the Board was guided by evidence taken from results of human experimentation and animal experimentation, which evidence indicated that there was a wide range of variation within zones of apparent normality. For this reason it was thought that standards to be applicable to an entire population would have to provide not only for the average individual but for those whose needs could be expected to exceed the average. Thus an allowance of 30 per cent was made to provide for those persons whose requirements might be greater than average.

A simple diet plan for everyday living is suggested in Table 5, which includes the protective foods each day as a foundation to aid in meeting the recommended daily allowances. This list meets the daily dietary allowances and furnishes the physician with an outline so that he may survey quickly the foods eaten and determine whether the patient's habits of eating are likely to be adequate or inadequate.

Numerous other combinations could be planned which are equally adequate and adapted to the available food supplies and dietary customs in a given situation. However, it should be remembered that once these combinations are devised, each food in such a list plays a specific role and, if omitted, should be replaced by another of equivalent food value.

It should also be understood that these allowances are for persons in health and in ordinary circumstances. The need may be greatly altered when certain conditions prevail—conditions such as illness, increased working hours, extremes of temperature to which workers are frequently exposed, increased perspiration, speed-up of work and insufficient rest, which increase energy consumption and produce a proportionate increase in the body's nutritional requirements. The need may be greatly altered in other diseases, especially those of the alimentary tract, which interfere with normal absorption, increased destruction or diminished utilization of vitamins.

TABLE 5

PROTECTIVE FOODS EACH DAY AS A FOUNDATION TO AID IN MEETING RECOMMENDED DIETARY ALLOWANCES

Milk	1 pint for adults, 1 quart for children
Egg	1
Vegetables	3 large servings besides potato (one green leafy)
Fruit	2 servings (one raw)
Meat, fish or fowl	1 serving (about 2½ oz.)
Butter	1 tablespoon
You need whole-grain products and enriched bread every day.	
Example:	
Cereal	whole-grain or enriched (1 serving)
Bread	whole-grain or enriched (3 slices)
Then eat additional foods as you like to meet energy requirements.	

An example of a typical diet for one day, incorporating the foods that serve as a basis to meet the essential requirements with additional foods added to make up the caloric needs of the average normal adult weighing 150 lbs., is outlined on pp. 58 and 59. Whenever the demand for additional energy is required, the calories to cover this need may be supplied by simply increasing the amount of fats or carbohydrates, or both. The explanation of the method of presenting the normal diet as outlined, as well as all diets in disease, will be further discussed under the section entitled "The Application of Diet Therapy."

SUBSTITUTIONS

A few suggested substitutions for egg and potato in the diet for a normal adult: these substitutions may be interchanged so long as they do not alter the amount of the "Essential Foods" required for an adequate diet.

In the place of one egg, the following may be taken:

Milk	1 glass
Milk soup	1 cup
Custard	1 serving
Cheese:	
Cottage or cream cheese	2 tablespoons
Solid cheese	1 one-inch cube
Meat, fish or fowl	1 very small serving (1 oz.)

In the place of one serving of potato, one of the following may be taken:

Bread	1 slice
Corn, rice, macaroni, spaghetti	1 serving

A Typical Diet for an Average Normal Adult Weighing 150 Lbs.

70 Gm. Protein
2,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 230, Protein 70, Fat 135, Calories 2,415

FOOD	GRAM WEIGHT	HOUSEHOLD MEASURE
Cereal (cooked) *	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	15	1 tablespoon
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	75	1 serving (2½ oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings (1½ cups)
Fruit, 10% Fruit, 15% Fruit, 20%	300	3 servings
Potato or substitute	200	2 servings (1 cup diced)
Dessert †	100	1 serving
Sugar	15	1 tablespoon
Approximate content of minerals:	Calcium, 1.000 Gm. (.9320) Phosphorus, 1.3458 Gm. Iron, .0147 Gm.	

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* Prepared cereals may be used in the place of cooked cereals in all diets unless it is specified to avoid. See list of comparative servings of cereals, p. 78.

† List of typical desserts, p. 77.

A Typical Diet for an Average Normal Adult Weighing 150 Lbs.

70 Gm. Protein
2,400 Calories

Suggested Distribution of Total Food Allowance for One Day

		GM.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked) *	⅔ cup	140
Bacon	2 slices	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Beverage		
LUNCHEON		
Egg (or egg substitute) †	1	50
Potato or substitute †	1 serving	100
Vegetable	1 serving	100
Salad:		
Fresh vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Meat	1 serving	75
Potato	1 serving	100
Vegetable	1 serving	100
Fruit salad	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Dessert	1 serving	100

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* Prepared cereal may be substituted for the cooked cereal. See list of comparative servings of cereals, p. 78.

† Substitutions, pp. 57, 81 and 82.

THE PREVALENCE AND THE NATURE OF DEFICIENCY STATES

The occurrence of deficiency diseases in the United States has not been noted generally, except in city hospitals, or in endemic regions. Although nation-wide dietary inadequacies have been revealed by surveys, frank deficiency diseases on such a scale have not been seen. According to their concepts, clinicians rightly assert that they do not see deficiency diseases; but they are incorrect in concluding that there is no widespread prevalence of them. Every nutritional survey in the past decade has revealed that the consumption of diets below the recommended standards is widespread in the United States. All these surveys reveal a marked prevalence of dietary inadequacies as judged by recommended standards. The evidence is consistent. All reports show that very many persons are not receiving the recommended amounts of essentials. The evidence that such a large proportion of the population is eating unsatisfactory diets points to possible widespread prevalance of deficiency states. Indeed, inasmuch as diet surveys have limitations and other factors besides diet enter into the production of deficiency diseases, it is possible, if not probable, that deficiency states are more prevalent than indicated by results of dietary surveys. Even when the diet seems to contain sufficient amounts of essentials, its adequacy is often apparent rather than real.

Malnutrition is accompanied by manifold signs and symptoms, diverse in nature, and to the casual observer their origin and significance are not always apparent. Some types of malnutrition are strikingly obvious to everyone, some are apparent only to the physician who looks for them, and some are vague and elusive even to the careful observer using the most accurate specialized technics. If the first group alone is counted, the prevalence of malnutrition will be recorded as low, almost negligible. If the second group is counted, it will be recorded as high. If the third group is included, then the rate will be sufficiently high to occasion genuine concern.

The nutritional deficiency in the United States is seldom complete, nor is it often due to the lack of any one single substance. More often, it is limited in extent and multiple in nature, and the resulting clinical picture is correspondingly hazy in outline. Deficiency disease occasionally appears in outspoken form of unquestionable, obvious state such as rickets, pellagra, scurvy or beriberi; but with vastly greater frequency the deficiency disease takes the form of vague, borderline states of ill-health which destroy the patient's happiness and impair his usefulness and his efficiency.

The manifestations of subclinical deficiency states may be long delayed, depending on the degree of dietary inadequacy, the period of exposure to bad diet, or the secondary pathologic states that may interfere with absorption and utilization of a good diet. Thus, functional debility may be apparent long before nutritional disease appears. This may be mild or severe.

Let me define the nature of the development of a deficiency state. The respiration and the growth of cells involve the synthesis of complex substances from simpler chemical compounds. By means of substances called enzymes the cells are able to perform these functions without increased temperature or pressure. Enzymes are catalysts produced by living cells from combinations of organic substances, including the vitamins. These enzymes retain activity even when separated from the living cell. When a dietary deficiency of vitamins has existed over a long period of time, a biochemical lesion often severe enough to cause functional disturbances develops in the cell. If the deficiency is not corrected, these disturbances become more widespread and eventually give rise to an infinite variety of symptoms forming a complex clinical picture. Finally, severe or persistent alterations lead to a structural change or structural changes in the tissue, and ultimately the lesion of a deficiency disease is likely to appear.

The term subclinical state of deficiency disease has been employed by physicians to describe the early subcritical states of disease that could not be recognized readily by available methods of examination. The term, naturally, is in disfavor because it is too often used as a cloak for ignorance.

The early, mild, latent or subclinical forms of deficiency disease are manifold in nature. They produce effects which are insidious and elusive. Prominent among the symptoms of subclinical deficiency states one may find one or more of the following symptoms: Poor appetite, lost weight, lost strength, weakness, indigestion and dyspepsia (heartburn), diarrhea, constipation and abdominal cramps, vague burning, itching, crawling sensations over the skin, nervous, irritable and depressed reactions with inability to sleep, apprehension, weeping spells, forgetfulness and mental confusion. A characteristic feature of nutritional deficiencies in humans is their multiple, symptomatic nature. Single deficiencies are uncommon in human beings; multiple deficiencies are the rule. This, of course, is in sharp contrast with the laboratory, where single deficiencies predominate by choice and are purposely produced singly when possible. This is desirable experimentally and has been very valuable, but it has undoubtedly been the explanation for delays, uncertainty and error in transferring laboratory-animal findings to clinical medicine. We are learning that the incidence of deficiency states is much greater than had been thought. Such mild, or latent, or subclinical deficiencies are of greater importance than the more advanced cases. They are less obvious, more difficult to detect, affect greater numbers of people and are more apt to pass unnoticed and, therefore, untreated. Their effects are often indirect, influencing general health and efficiency rather than producing characteristic disease syndromes. The multiple nature of the deficiencies has favored a more or less careless attitude toward diagnosis on the part of the physician. It is clear that the first problem in practice is to determine when a deficiency state exists or is likely to occur. This is not altogether an easy matter. While simple enough in the fully developed deficiencies, it is more difficult to diagnose the early, mild, latent or subclinical deficiency states. These states are, however, the types of cases which must be diagnosed if full advantage is to be taken of the newer developments in nutrition and progress is to be made in the diagnosis, the prevention and the treatment of these diseases. It is of no advantage to the patient, certainly, to wait until the deficiency diseases are perfectly obvious and fully developed before a diagnosis is made and before treatment is recommended.

METHODS OF DIAGNOSTIC AID IN DETERMINING DEFICIENCY STATES

No longer should a patient be dismissed with the time-worn phrase, "There is nothing physically the matter with you," and the assumption that an imaginary or a nervous reaction is responsible. Too many times the diagnosis of chronic nervous or physical exhaustion has been substituted due to the lack of diagnostic criteria adequate to pigeonhole the case as a diagnostic entity. If nothing can be found physically or organically to account for the distress the patient manifests, not until all the light afforded by modern means of diagnosis of nutritional deficiencies is thrown upon the case in question should it be assumed that some malfunction of the physiologic mechanism is not responsible for the earliest manifestations of subclinical states of deficiency disease.

Deficiency disease is a question that should be given the attention of the intelligently progressive clinician. It is true that the human body can stand a lot of depletion. Vitamin deficiencies viewed experimentally may take from three to six months to manifest themselves even under laboratory, to say nothing of clinical, observation. Marginal states of nutrition, it is true, may be maintained in man for fairly long periods until the advent of some secondary pathologic state or illness or some extreme stress or strain increases the demands over and above the limited intake and, therefore, brings the deficiency state to light.

We should not bury our heads in the sand and disregard the results of carefully planned studies that have demonstrated clearly the widespread incidence of nutritional deficiencies; nor, on the other hand, should we accept the snap judgment of those whose views are based on hit-and-miss observation as compatible with scientific progress.

Because vitamin deficiencies occur not only as independent diseases, but, what is perhaps more often the case, as a complication of other diseases, it is obvious that all who are engaged in practice must be conscious of their existence and alert to detect them. Any patient who is restricted by any cause in his intake of food or who, even with an adequate intake of food, suffers any interference with absorption or utilization should be examined critically for the possible presence of a vitamin deficiency. It is to be feared that the presence of multiple deficiencies in many cases and the absence of clear-cut signs or symptoms in the milder forms may foster carelessness and incomplete diagnosis and the complacent acceptance of such general terms as deficiency disease, multiple avitaminosis and the like. Such assumptions are likely to lead to the uncritical or the indiscriminate use of complex vitamin mixtures in treatment. We suggest the following few methods to aid in determining these early, mild, latent, subclinical vitamin deficiencies:

In general, there are five methods of diagnosing dietary deficiencies: (1) To make a careful scrutiny of the diet (food eaten); (2) to watch for signs and symptoms of a deficiency as determined by history and physical examination; (3) to investigate factors which influence the digestion, the absorption and the utilization of the diet (conditioned malnutrition); (4) to make laboratory tests by the methods described for the presence of various vitamin deficiencies; and (5) to make a therapeutic trial with specific vitamin concentrates.

Making a Careful Scrutiny of the Diet (Food Eaten). The necessity for detailed, often minute, inquiry as to the foods eaten should be emphasized. The importance of the quantitative and the qualitative factor in diet makes this necessary. It is especially helpful to have the patient record the kind and the amount of food eaten over a period of a week or more, if necessary. While error is possible with this method, it has proved a valuable aid in diagnosis. We are frequently astonished at the dietary deficiencies disclosed. By going over this data it can be quickly determined whether the patient's daily intake is meeting the essential requirements (Table 5) necessary to meet adequately the recommended daily allowances. A poor vitamin intake frequently exists for a long time before it can be recognized clinically. There are two basic factors responsible for errors in eating that make for an inadequate amount of vitamins in the diet. One is economic necessity, the other is ignorance of diet—for example, eccentricities in diet, such as excessive carbohydrates; fads in diets, such as improper weight reduction; chronic alcoholism which causes replacement of part of the diet; self-imposed diets, such as are associated with psychoneurotics; prolonged adherence to diet prescribed by physicians, especially in the treatment of peptic ulcer, chronic nephritis, chronic colitis, allergic states, cardiac diseases and biliary-tract diseases.

Watching for Signs and Symptoms of a Deficiency, as Determined by History and Physical Examination. Every experienced physician knows that the recognition, both subjective and objective, of early deficiency states as determined by history and physical examination is very difficult. The unscrambling of symptoms is a challenge.

The symptoms (Table 6) and physical signs (Table 7) suggestive of deficiency states are listed in the accompanying tables. The signs and the symptoms suggestive of deficiency states, whether they are produced by primary deficiency due to inadequate dietary intake or occur when the intake is adequate or are brought about by conditioning factors,

TABLE 6

SYMPTOMS SUGGESTIVE OF DEFICIENCY STATES
Infants and Children
Pain on sitting and standing
Poor sleeping habits
Backwardness in school
Repeated respiratory infections
Abnormal intolerance of light (photophobia)
Abnormal discharge of tears
Lack of appetite
Failure to eat adequate breakfast
Failure to gain steadily in weight
Late period of sitting, standing, walking
Aversion to normal play
Chronic diarrhea
Inability to sit
Adolescents and Adults
Lack of appetite
Lassitude and chronic fatigue
Loss of weight
Lack of mental application
Loss of strength
History of sore mouth or tongue
Chronic diarrhea
Nervousness and irritability
Burning, prickling of skin (paresthesia)
Night blindness
Abnormal intolerance of light (photophobia)
Burning or itching of eyes
Abnormal discharge of tears (lacrimation)
Muscle and joint pains, muscle cramps
Sore, bleeding gums
Tendency to bleed

TABLE 7

PHYSICAL SIGNS SUGGESTIVE OF DEFICIENCY STATES		
SYSTEM	FINDING	SUGGESTED DEFICIENCY OR SYNDROME
Eyes	Corneal and conjunctival changes	Riboflavin
	Xerosis conjunctivae and corneae	Vitamin A
	Central ophthalmoplegia	Thiamine
Mucous Membranes	Scarlet-red stomatitis and glossitis with or without secondary Vincent's infection	Nicotinic acid
	Magenta glossitis	Riboflavin
	Atrophic glossitis	Nicotinic acid, B complex, Addisonian anemia, Plummer-Vinson syndrome
	Scorbutic gums (spongy, bleeding gums)	Ascorbic acid
	Cheilosis	Riboflavin
	Nonspecific urethritis, balanitis, vaginitis (senile)	Nicotinic acid–vitamin A
Teeth	Caries	Vitamin A, vitamin D, calcium, phosphorus
Skin	Pellagrous dermatitis	Nicotinic acid
	Seborrheic lesions in nasolabial folds on face, behind ears and in skin folds	Riboflavin
	Hyperkeratosis and hyperfolliculosis	Vitamin A
	Hemorrhagic manifestations	Vitamin K, ascorbic acid
	Fissures in angles of mouth	Riboflavin
Neurologic	Characteristic bilateral symmetrical polyneuropathy	Thiamine
	Combined system syndromes	Thiamine, B complex, Addisonian anemia
	Loss of vibratory sensation	Thiamine
	Wernicke's syndrome	Thiamine, B complex
	Nicotinic-acid-deficiency encephalopathy	Nicotinic acid
	Progressive stupor and hebetude	Nicotinic acid
	Certain organic reaction psychoses	Nicotinic acid, thiamine and B complex
Skeletal	Rachitic deformities: Square head, wrists enlarged, rib-beading, bowed legs and osteomalacia	Vitamin D, calcium, phosphorus
General	underweight, underheight, edema, pallor	Calories, proteins, iron, B complex

are identical. It is necessary to point out, however, that with few exceptions the findings characteristic of deficiency states or malnutrition are nonspecific. Some lesions attributable to deficiencies may be produced by local tissue deficiency as a result of circulatory disturbances, trauma, pressure or infection. These local conditioning factors may produce lesions identical to those of a systemic deficiency. Other lesions may not be related to either systemic or local tissue deficiency, but may be due to some factor other than malnutrition or dietary inadequacy. These facts indicate that all the diagnositic skill and the clinical acumen employed by physicians in any other branch of clinical medicine must be employed in the interpretation of lesions usually ascribed to dietary deficiency states. The following example illustrates this point:

The mucous-membrane lesions in and about the mouth present complex diagnostic problems: in some cases a magenta glossitis responds to riboflavin; in some others, to pyridoxine; and in still others, only to crude liver extract administered parenterally. Cheilosis may appear the same, whether due to a riboflavinosis, to edentulous mouth, to allergy or to lipstick. Scarlet fungiform papillae at the tip of the tongue are the earliest visible signs of mild, acute nicotinic-acid deficiency, but pipe-smoking, particularly in persons unaccustomed to a pipe, may produce a similar picture. Vincent's gingivitis and stomatitis may occur in deficiencies of both ascorbic acid and nicotinic acid. This infection becomes active only in the presence of necrotic tissue. Ascorbic-acid and nicotinic-acid deficiencies are only two of many causes of tissue necrosis in the mouth. In other words, when the physician is presented with any of the signs or symptoms listed in Table 6 or 7 and is unable in his differential diagnostic efforts to find any particular pathology responsible, he is obligated to take into serious consideration the possibilities of a dietary deficiency state being responsible.

Investigating Factors Which Influence the Digestion, the Absorption and the Utilization of the Diet (Conditioned Malnutrition). The terms malnutrition, nutritional deficiency disease, nutritional failure, pellagra, scurvy, beriberi, thiamine deficiency and similar terms signify to many persons disorders arising solely from an inadequate diet, but all these may occur in the presence of dietary adequacy. As pointed out by Kruse, these terms should denote a deficiency in the bodily tissues rather than in the diet. If a tissue deficiency arises from an inadequate dietary intake, it is known as a primary deficiency. If the tissue deficiency is caused by factors other than an inadequate diet alone, it is known as a conditioned deficiency. Conditioned deficiencies are caused by factors that interfere with the ingestion, the absorption or the utilization of essential nutrients, or that increase their requirements, destruction or excretion. The importance of these conditioning factors as a cause of deficiency disease, with or without the patient's taking an adequate diet, has not generally been recognized. The various illnesses and conditions that may produce such deficiencies are listed in Tables 8 to 13. It should, of course, be emphasized that the listings in these tables are not complete; it is merely intended by them to call attention to the more common illnesses, the therapeutic measures and the physiologic alterations which condition the production of the deficiency state.

Making Laboratory Tests for Detection of Deficiency States. It is often difficult to diagnose vitamin deficiency. In spite of

TABLE 8

CONDITIONS INTERFERING WITH INGESTION OF VITAMINS
Gastro-intestinal disorders:
Acute gastro-enteritis, gallbladder disease, peptic ulcers, diarrheal diseases and obstructive lesions of gastro-intestinal tract
Neuropsychiatric disorders:
Neurasthenia, neurosis, psychoneurosis, psychoses, migraine and neurologic disorders interfering with self-feeding
Anorexia:
Alcohol, operations, anesthesia, infectious diseases, congestive heart failure, thiaamine deficiency, visceral pain
Food allergy
Loss of teeth
Pregnancy
Therapeutic diets:
Diets restricting ingestion of essential foods

TABLE 9

CONDITIONS THAT INCREASE THE NEED OF VITAMINS
Rapid growth
Pregnancy and lactation
Increased total metabolism as associated with abnormal activity:
Prolonged strenuous physical exertion, delirium and certain psychoses
Abnormal environmental factors:
Excessively high temperatures, as in the tropics, in deserts and in certain industries
Excessive light glare, as from snow or klieg lights
Fever
Therapy such as thyroid, alphadinitrophenol, parenteral dextrose solutions, fever therapy, high carbohydrate diets
Increased metabolism (hyperthyroidism)
Infectious and toxic states and their convalescence

TABLE 10

CONDITIONS THAT DIMINISH THE ABSORPTION OF VITAMINS
Achlorhydria
Gastro-intestinal diseases associated with hypermotility or reduction of absorbing surfaces
Biliary disease, especially obstructive jaundice
Vitamin deficiency
Vomiting
Diarrhea
Therapy:
Liquid petrolatum, colloidal adsorbents, severe catharsis, gastric or intestinal resections and short-circuiting operations

TABLE 11

CONDITIONS THAT MAY DIMINISH UTILIZATION OF VITAMINS
Achylia
Gastric resection—especially subtotal
Hepatic dysfunction, as in:
Liver disease, diabetes mellitus, alcoholism
Hypothyroidism
Advanced pancreatic disease
Malignancy
Therapy:
Sulfonamide drugs, radiation therapy

TABLE 12

CONDITIONS THAT INCREASE THE DESTRUCTION OF VITAMINS
Diminished gastro-intestinal secretions or absence of them
Bacterial and chemical interactions
Therapy:
Alkalis, sulfonamides, arsenicals

TABLE 13

CONDITIONS INCREASING EXCRETION OF VITAMINS
Polyuria, as in:
Diabetes mellitus, diabetes insipidus
Lactation
Excessive perspiration
Therapy:
Long-continued excessive fluid intake, as in urinary-tract infections
Loss of fluids by diuresis, as in anasarca

careful scrutiny of the diet, it may be difficult to obtain a reliable dietary history from the patient. The symptoms and the physical signs suggestive of deficiency, particularly of deficiency of vitamins of the B complex, may be so numerous and varied as to be very difficult to interpret clinically. In some cases, though the dietary history has been entirely normal, and there is no apparent condition to prevent normal utilization of the food eaten, certain deficiency manifestations clear up as a result of therapeutic tests with vitamin supplements. Therefore, in the effort to diagnose vitamin deficiencies, laboratory tests to determine a patient's vitamin status have their place. In recent years, certain laboratory procedures have been developed which augment the diagnostic approach. Some of these laboratory procedures and practices (Table 14) have been in use many years and have been adequately studied and evaluated. Others have been developed only recently and may be subject to modification as progress is made in the field of deficiency diseases. Certain of the diagnostic tests mentioned require special laboratory facilities and are obviously not adaptable in their present form for use in the average routine laboratory. Yet it seems worth while to assemble those tests which at the

TABLE 14

Laboratory Tests for Detection of Deficiency States

TEST	DEFICIENCY IT MAY DETECT
Photometer (dark adaptation)	Vitamin A
Determination of vitamin A and carotene in blood serum	
Blood pyruvic acid	Thiamine
Excretion of trigonelline	Nicotinic acid
Plasma ascorbic acid	Vitamin C deficiency
Test of ascorbic-acid content of tissues (saturation)	
Test of capillary fragility	
Serum calcium	Vitamin D and calcium deficiency
Serum phosphorus	
Serum phosphatase	
Blood prothrombin	Vitamin K deficiency
Total protein, serum, albumin and globulin	Protein deficiency
Red blood cell count	Iron-deficiency anemia, Addisonian anemia, macrocytic anemia
Hemoglobin	
Stained blood smear	
Red blood cell volume	
Roentgenogram of hand and wrist, elbow and hip	Rickets and scurvy in children; osteomalacia and scurvy in adults
Roentgenogram of heart	Advanced beriberi
Electrocardiogram	Changes suggestive of thiamine deficiency
Biomicroscopic eye examination with slit lamp	Capillary invasion of cornea (riboflavin deficiency); changes in conjunctivae (vitamin A deficiency)

present time are the most helpful in the diagnosis of deficiency states.

It is hoped that in the future methods will be devised so that borderline states will be better recognized and identified, both by a better understanding of physical signs and symptoms suggestive of early deficiency states and by new and more simplified laboratory tests which will show if an individual's bodily stock of vitamins is really low.

Making Therapeutic Tests with Vitamin Supplements. Certain deficiency manifestations clear up as a result of therapeutic tests with vitamin supplements. This may also be of considerable diagnostic aid. A number of factors may influence the response; therefore, they are of importance diagnostically and therapeutically. When the therapeutic test is used, the preparation should be a specific vitamin concentrate and it should be as pure as possible. Treatment with several of the vitamins may be indicated; for example, a combination of A and D of the fat-soluble vitamins or concentrates of the vitamin B complex components of the water-soluble vitamins. The factor of dosage is of great importance, particularly in treatment or cure as contrasted with prevention. This is especially true when the avitaminosis complicates other diseases, when there is interference with absorption and utilization, when there is increased demand, or when there are conditions which lead to increased destruction of the vitamin intake. When absorption by usual routes is hindered, administration should be by routes which ensure absorption. In other words, there will be occasions when the parenteral use of vitamins will be far preferable to oral administration, and even necessary. In certain instances it will be necessary to add the vitamin concentrates directly to the solutions which are being administered intravenously. In prophylaxis, in very mild deficiencies or in maintaining a cure, consideration of economy and palatability, also common sense, indicates the use of natural foodstuffs. However, it is necessary to ensure the availability of food, the proper preparation of it and the continuance of an adequate intake. In using vitamin concentrates, one must beware of overdosage, not so much because of harm or danger, which is almost nonexistent with the substances, but to protect the patient's pocketbook and to avoid waste generally, the possibility of which is greatly enhanced by the relative high cost of some concentrates and poor preparation. For specific outline of vitamin food sources recommended, daily allowances for each vitamin as suggested by the Food and Nutrition Board of the National Research Council and the daily therapeutic dosage, turn to fat-soluble and water-soluble charts, pages 25 to 28 and 43 to 51.

PART II

THE APPLICATION OF DIET THERAPY

The Application of Diet Therapy

QUALITATIVE DIET
QUANTITATIVE DIET
METHOD OF CALCULATION OF DIETS
METHOD OF APPLYING DIETS
SERVINGS
  TYPICAL DESSERTS
  COMPARATIVE SERVINGS OF CEREALS
  COMPARATIVE SERVINGS OF BREAD AND BREADSTUFFS
SERVINGS (*Continued*)
  COMPARATIVE SERVINGS OF DAIRY PRODUCTS
  COMPARATIVE SERVINGS OF MEAT
  COMPARATIVE SERVINGS OF VEGETABLES
  COMPARATIVE SERVINGS OF FRUIT
A FEW SUGGESTED SUBSTITUTIONS
METHOD OF CHANGING DIET PRESCRIPTIONS
SUGGESTIONS FOR CHANGING PROTEIN AND CALORIC CONTENT OF DIETS

In the previous chapter an attempt has been made to outline briefly the scientific principles of the newer knowledge of nutrition. The selection of food is based upon these principles so that the food chosen will be adequate for the needs of the body of the normal adult in health.

A simple understanding of what comprises an adequate and protective diet is the foundation essential for health. Individual dietetic education and instruction in measured diets has become the most important first step in the treatment of an increasing number of disorders in disease. Treatment by diet today should be applied by the use of:

1. Qualitative diets
2. Quantitative diets:
   (a) Estimated quantitative (household measure)
   (b) Weighed quantitative (gram weight)

In the application and the teaching of these methods an ever-growing part is being played by the well-trained dietitian.

QUALITATIVE DIET

Simple qualitative diet means just the omission of certain articles of food, such as thorough restriction of sugars and starches in a mild case of diabetes, or coffee, tea and cocoa when a patient is nervous. For moderate reduction of weight in simple obesity the gross fats and carbohydrates, such as butter, cream, gravies, oil dressings, pastries, table sugar, breads, and perhaps even potatoes and rice, should be curtailed. Many patients will be fortunate enough to derive sufficient relief from the simple omission of the typical foods they should avoid so that they will find it unnecessary to go into further details of management.

The distinction between simple qualitative and quantitative diets is not always made clear to the patient. Such distinction must be definitely understood in all cases in which patients fail to improve by qualitative restrictions within a reasonable length of time, or in those cases in which diet is of paramount importance in relation to the disease.

QUANTITATIVE DIET

A quantitative diet is one in which any article of food eaten should be thought of in terms of carbohydrate, protein, fat and calories, and in which the quantitative estimation of these values is imperative. No food should be eaten in unlimited quantities. Any article of food may be eaten provided it contains proportions of carbohydrate, protein or fat in amounts that can be incorporated in the total quantity of carbohydrate, protein and fat that is allowed each twenty-four hours and does not displace any of the foods required to make the diet adequate and protective.

An estimated quantitative diet is one that is expressed by the simple household measures, such as teaspoon, tablespoon, glass, standard measuring cup, slices of bread, squares of butter, servings of meat in ounces, servings of fruits and vegetables. A discussion of servings is given on page 75.

A weighed quantitative diet must be resorted to if the estimated quantitative diet proves to be inadequate. This necessitates the use of food scales and an accurate knowledge of the carbohydrate, the protein and the fat composition of food. Many patients may feel this to be a difficult task and resent the added work. It is well to caution patients needing quantitative weighed diets that successful dietary treatment cannot be achieved by a month's enthusiastic effort followed by a return to the old habits. Success depends on their acquiring a thorough knowledge of the fundamentals of dietetics and, under the physician's guidance and co-operation, developing and maintaining the new habits of food intake suitable to their individual needs. When these patients are convinced that a fair trial of weighing food is justified, they are soon astounded to find that weighing food is not so much of a task as they had anticipated. After several weeks they may be able to estimate their food proportions by the eye. They learn that the different foods have a marked difference in weight and in proportion of carbohydrate, protein and fat. Finally, they learn that it is not difficult to juggle figures and make substitutions in the diet to increase its palatability and still keep the diet adequate and protective. A few of the most common substitutions are listed on pages 57, 81 and 82.

METHOD OF CALCULATION OF DIETS

The total food allowance for one day of all the diets outlined in this book is first calculated in quantitative amounts by the gram weight of the various foods used in the diet. These gram weights are then expressed in estimated quantitative servings by the use of household measures. The diet prescription of this food requirement for one day is expressed in grams of carbohydrate, protein and fat with the total calories. A variation in the diet prescription of a plus or minus one gram of protein, fat or carbohydrate in all weighed diets has been allowed. In unweighed diets a variation of plus or minus two grams of carbohydrate, protein or fat is permissible.

In making an appraisal of the nutritive value of any diet outline, a question may arise concerning the selection of figures on food composition to be used for this purpose. Nutritional accounting of the food intake has been based on various tables of food composition. There are two extreme schools of thought concerning food tables: one group tends to regard the figures in them as having the accuracy of atomic weight determinations; the other dismisses them as valueless on the grounds that a foodstuff may be so modified by the soil, the season or its rate of growth that no figure can be a reliable guide to its composition. The truth for clinical purposes in outlining diets for human consumption lies somewhere between these points of view.

Calculation of Vegetables and Fruits in Diets. In the calculation of the diets and in planning the skeleton outlines no vegetable or fruit has been designated by name, except in a few instances, when it is necessary that the patient be given a specific food for a short time. The vegetables and the fruits are calculated on the basis of the percentage of carbohydrate contained in the fresh food. For example, wherever the diet calls for 100 Gm. of a 3 per cent vegetable, any one of the vegetables found under the classification of 3 per cent is permitted. This is also true of the vegetables under 6 per cent, 15 per cent and 20 per cent, and of fruits under 5 per cent, 10 per cent, 15 per cent and 20 per cent. By this method the patient may soon be taught to plan many different menus and various combinations from day to day.

Because of the fact that commercial brands of canned foods, especially fruits, vary in the amount of sugar used in preparation, the percentage of carbohydrate content in any of them cannot be given. For this reason, in order to make a more accurate calculation of the diets, it has been necessary to use the figures for the composition of fresh fruits in all diets, even in those cases in which there is no objection to the patient's having fruits cooked or canned with sugar.

In all instances in which there is no objection to an increase in the carbohydrate or a slight increase in the calories of the diet, canned fruits may be used.

For the convenience of the reader a classification of fresh vegetables and fresh fruits is found below.

METHOD OF APPLYING DIETS

In order to teach the application of the quantitative and the estimated quantitative total food allowance for one day we have found in our experience that the best plan is to divide this food into three meals. This will ensure a better understanding, especially on the part of the patient, of the proper distribution of the total amount of food required in the diet. We have, therefore, outlined on the page opposite each quantitative and estimated quantitative diet a suggested distribution of the total food allowance for one day into three meals, expressed first in household measures and then their equivalent in gram weight.

These suggested distributions of total food allowance for one day are not menus but skeleton outlines which simplify the planning of the day's menu and allow for a variation of foods from day to day. Thus many menus may be constructed from one outline.

SERVINGS

One of the most important and most difficult problems in the use, the application or the teaching of dietotherapy is the interpretation of the term serving. Everyone has his own conception as to what constitutes a serving of the various food materials. In order to make clear our conception or standard of a serving of the various food materials, we have attempted to visualize in a picture the comparative servings of the different groups of foodstuffs. We have followed each picture with a list of the most common foods used. In all lists of foodstuffs we present the gram weight of what we consider a serving and translate this into its approximate equivalent in a household measure.

We have not pictured any desserts but have considered that one serving of a dessert is approximately 100 Gm. or, by measure, approximately ½ cup or a two-inch cube of pudding, cake, etc.

CLASSIFICATION OF FRESH VEGETABLES AND FRESH FRUITS ACCORDING TO PERCENTAGE OF CARBOHYDRATE CONTENT

VEGETABLES

3%	6%	15%	20%
Asparagus	Artichoke, French	Parsnips	Corn
Beet greens	Beets	Salsify	Garlic
Broccoli	Carrots	Peas	Horseradish root
Brussels sprouts	Celeriac		Potatoes
Cabbage	Dandelion greens		Dried beans
Chinese cabbage	Kale		
Cauliflower	Kohlrabi		
Celery	Leeks		
Cucumber	Onions		
Eggplant	Parsley		
Endive	Peas (tiny)		
Lettuce	Pumpkins		
Marrow	Rutabaga		
Mustard greens	String beans (mature)		
Green pepper	Squash		
Okra	Turnips		
Radish			
Sauerkraut			
Sorrel			
Spinach			
String beans (tiny)			
Summer squash			
Tomatoes			
Water cress			

FRUITS

5%	10%	15%	20%
Muskmelon	Blackberry	Apple	Banana
Honeydew	Cranberry	Apricot	Fig (fresh)
Watermelon	Gooseberry	Blueberry	Grape juice
Rhubarb	Grapefruit	Cherry	Fresh prune
*Avocado	Lemon	Currant	
	Lime	Grape	
	Orange	Guava	
	Papaya	Huckleberry	
	Peach	Nectarine	
	Pineapple	Papaw	
	Strawberry	Pear	
	Tangerine	Plum	
		Quince	
		Raspberry	

* Avocados contain 17.2 per cent fat. Mushrooms have no assimilable carbohydrate, fat or protein.

Typical Desserts

The typical desserts used in the calculation of the diets are:

Gelatin:
- Spanish cream
- Fruit Bavarian
- Fruit
- Plain (Jello)

Sherbets and ices:
- Lemon ice
- Grape ice
- Fruit sherbet
- Fruit milk sherbet
- Fresh fruit milk sherbet

Ice cream:
- Vanilla
- Nut
- Strawberry
- Chocolate
- Custard

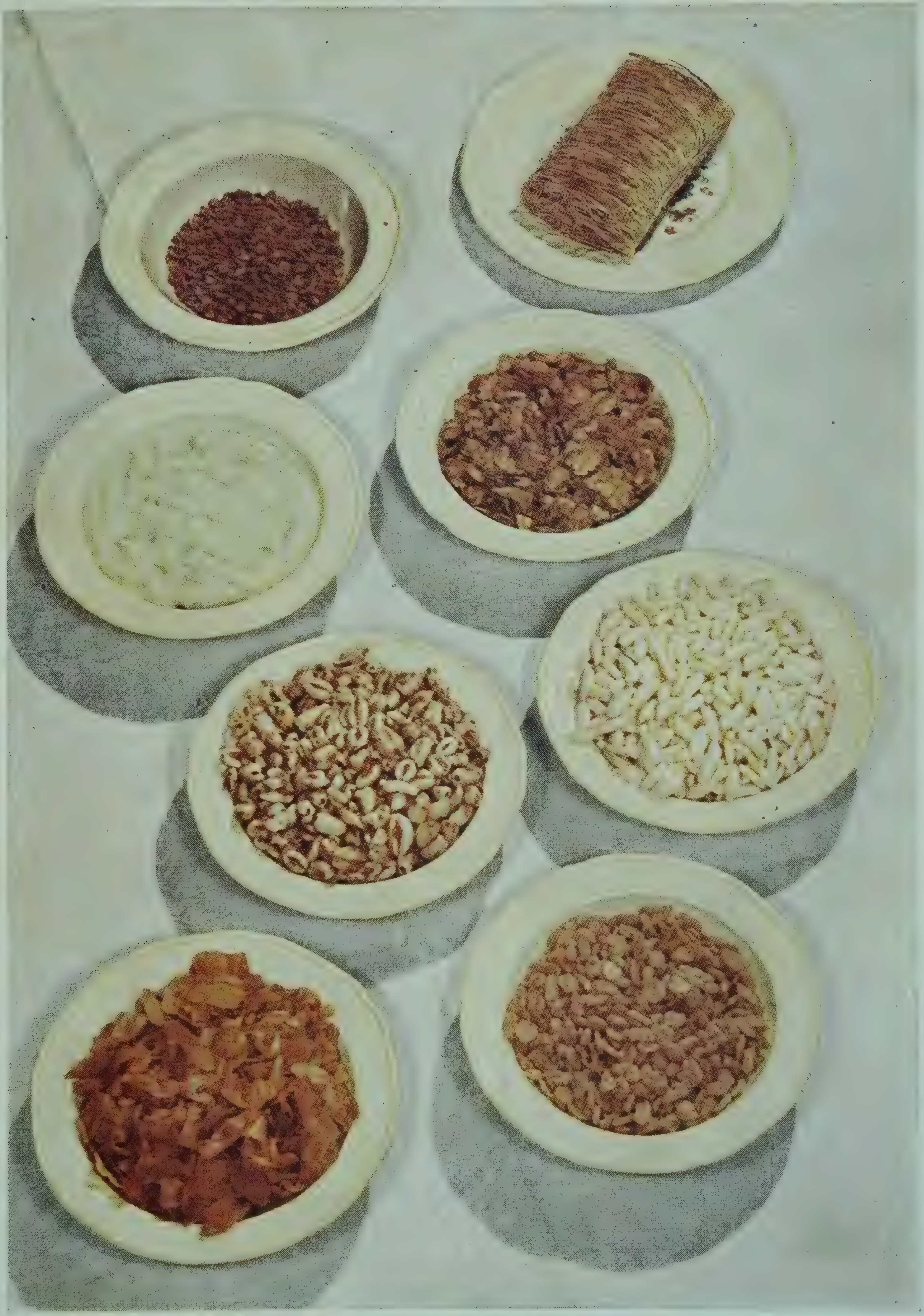
Cake:
- Angel food
- Sponge
- Chocolate
- Spice
- Plain
- Lady Baltimore

Pudding:
- Custard
- Pumpkin custard
- Bread
- Bread with raisins
- Rice
- Tapioca cream
- Fruit tapioca
- Vanilla blanc mange
- Chocolate blanc mange
- Prune whip
- Norwegian prune
- Brown Betty
- Hawaiian fruit
- Graham whip
- Date

Comparative Servings of Cereals

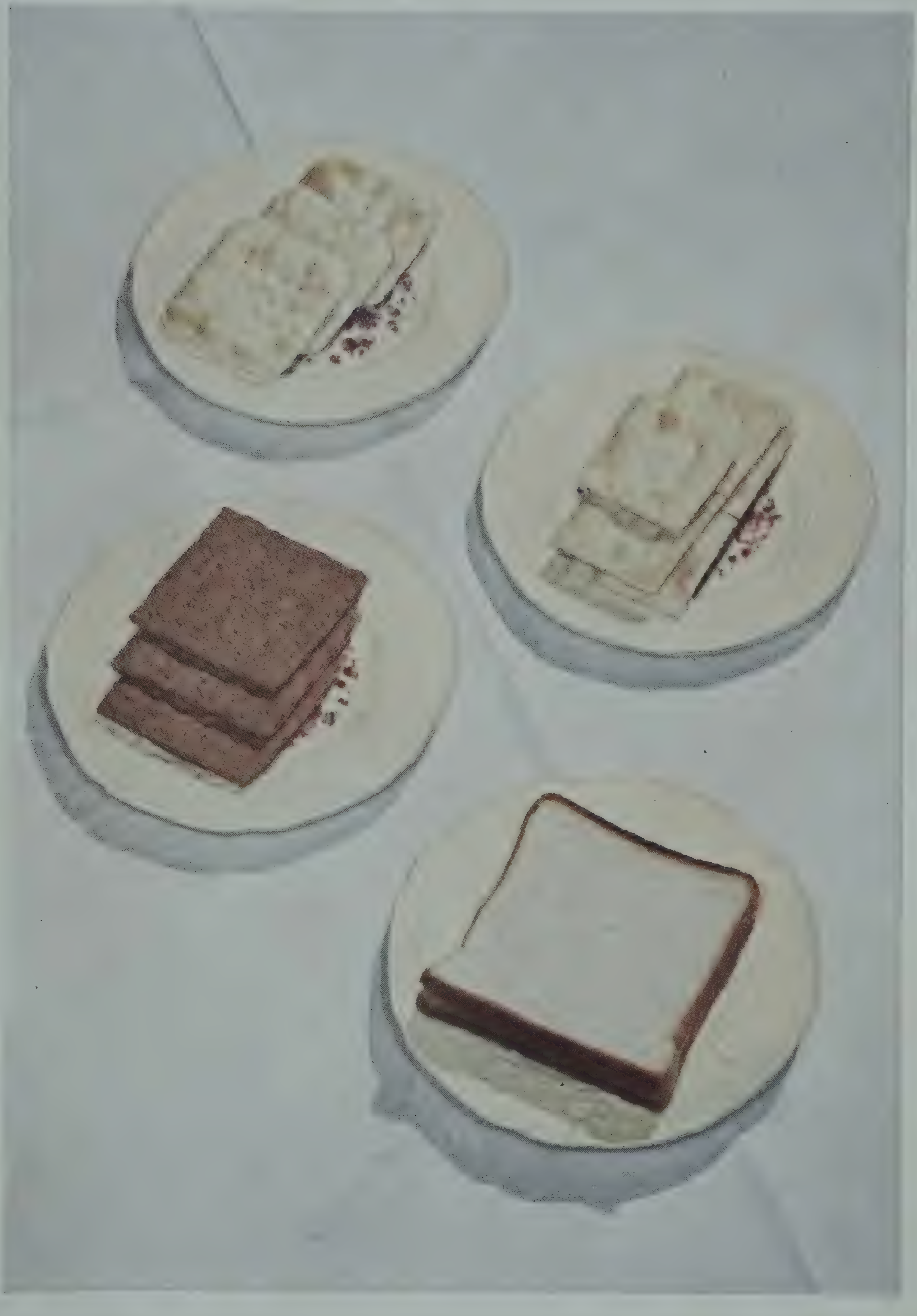
Cereals	*Gram Weight*	*Household Measure*
Prepared:		
Cornflakes	20	⅔ cup
Puffed rice	15	¾ cup
Puffed wheat	15	¾ cup
Rice Krispies	15	½ cup
Rice flakes	15	½ cup
Wheat flakes	20	¾ cup
Grapenuts	20	3 tablespoons
Shredded wheat	28	1 large size
Cooked	105	½ cup
	140	⅔ cup

PLATE 3



Comparative servings of cereals: Grapenuts, shredded wheat, cooked cereals, rice flakes, puffed wheat, puffed rice, cornflakes and Rice Krispies.

PLATE 4



Comparative servings of bread and bread stuffs: soda crackers, saltines, graham crackers and bread.

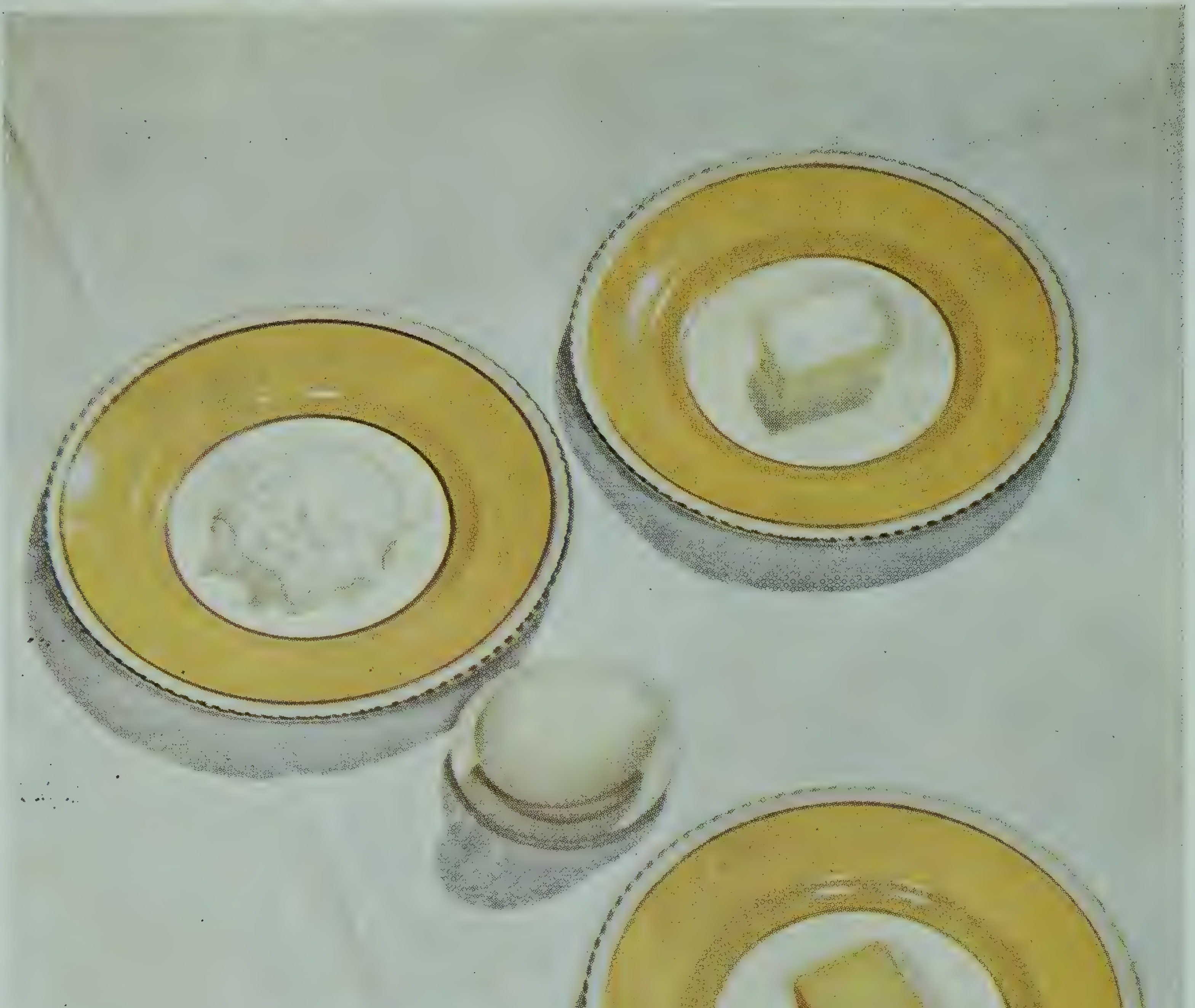
COMPARATIVE SERVINGS OF BREAD AND BREADSTUFFS

Bread and Breadstuffs	*Gram Weight*	*Household Measure*
Bread:		
White	30	1 slice
Whole-wheat	30	1 slice
Rye	30	1 slice
Zwieback	20	2½ pieces
Crackers:		
Soda	20	3 crackers (3″ x 3″)
Saltine	20	5 crackers (2″ x 2″)
Graham	20	3 crackers
Wheat pastes:		
Macaroni, cooked	100	½ cup
Spaghetti, cooked	100	½ cup
Noodles, cooked	100	½ cup

COMPARATIVE SERVINGS OF DAIRY PRODUCTS

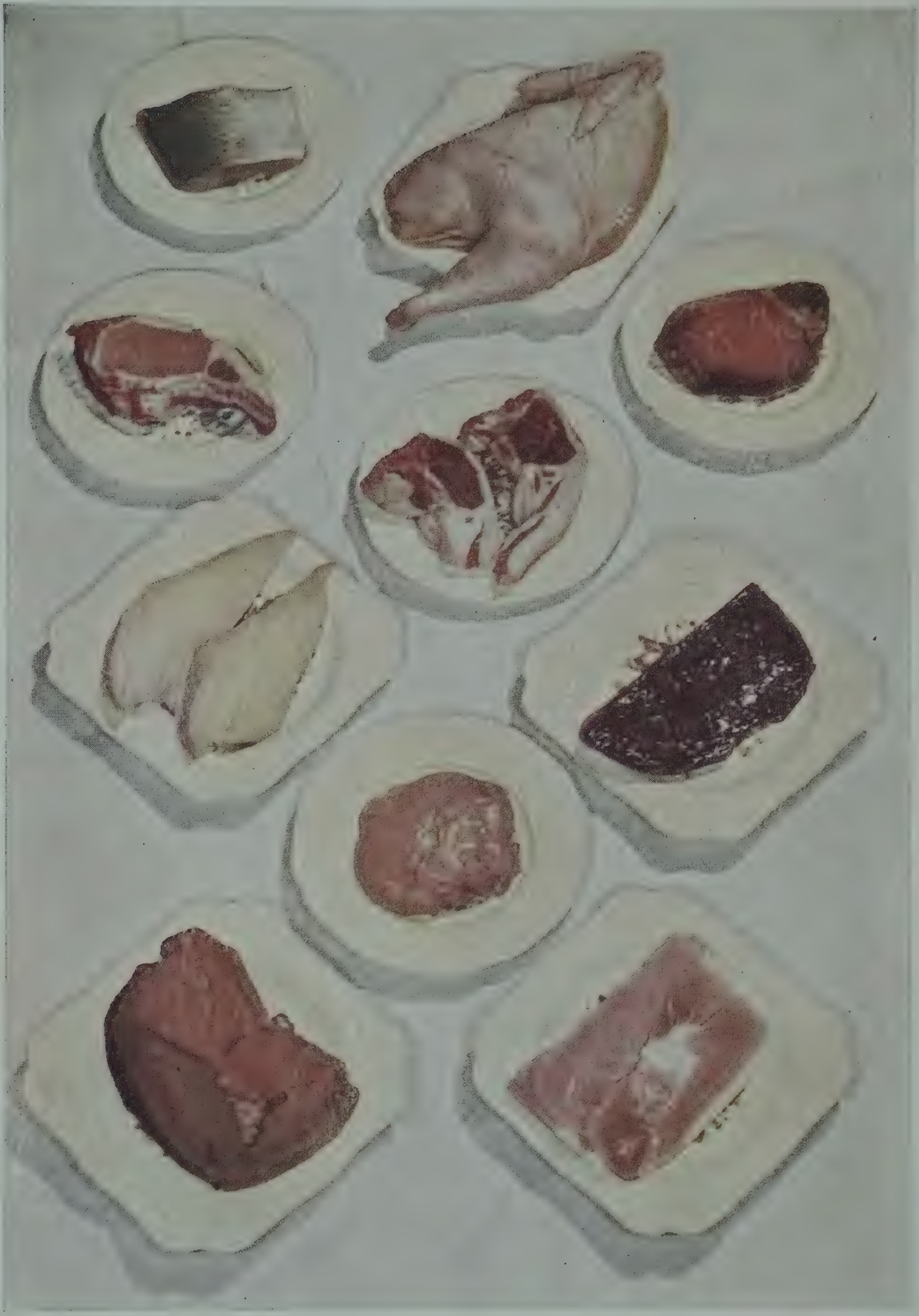
Dairy Products	*Gram Weight*	*Household Measure*
Cheese:		
Cottage	30	2 tablespoons
Cream (soft)	20	1½-inch cube
Solid (American Swiss, etc.)	20	1-inch cube
Roquefort (and other cheeses)	20	equivalent of 1-inch cube
Egg	50	1

PLATE 5



Comparative servings of dairy products: cottage cheese, soft cream cheese, egg, Roquefort cheese and American cheese.

PLATE 6



Comparative servings of meats (approximately 75 Gm., 2½ oz.): fish, chicken (broiler), pork chop, lamb chops, beef tenderloin, chicken (sliced), liver, sweetbreads, roast beef and ham.

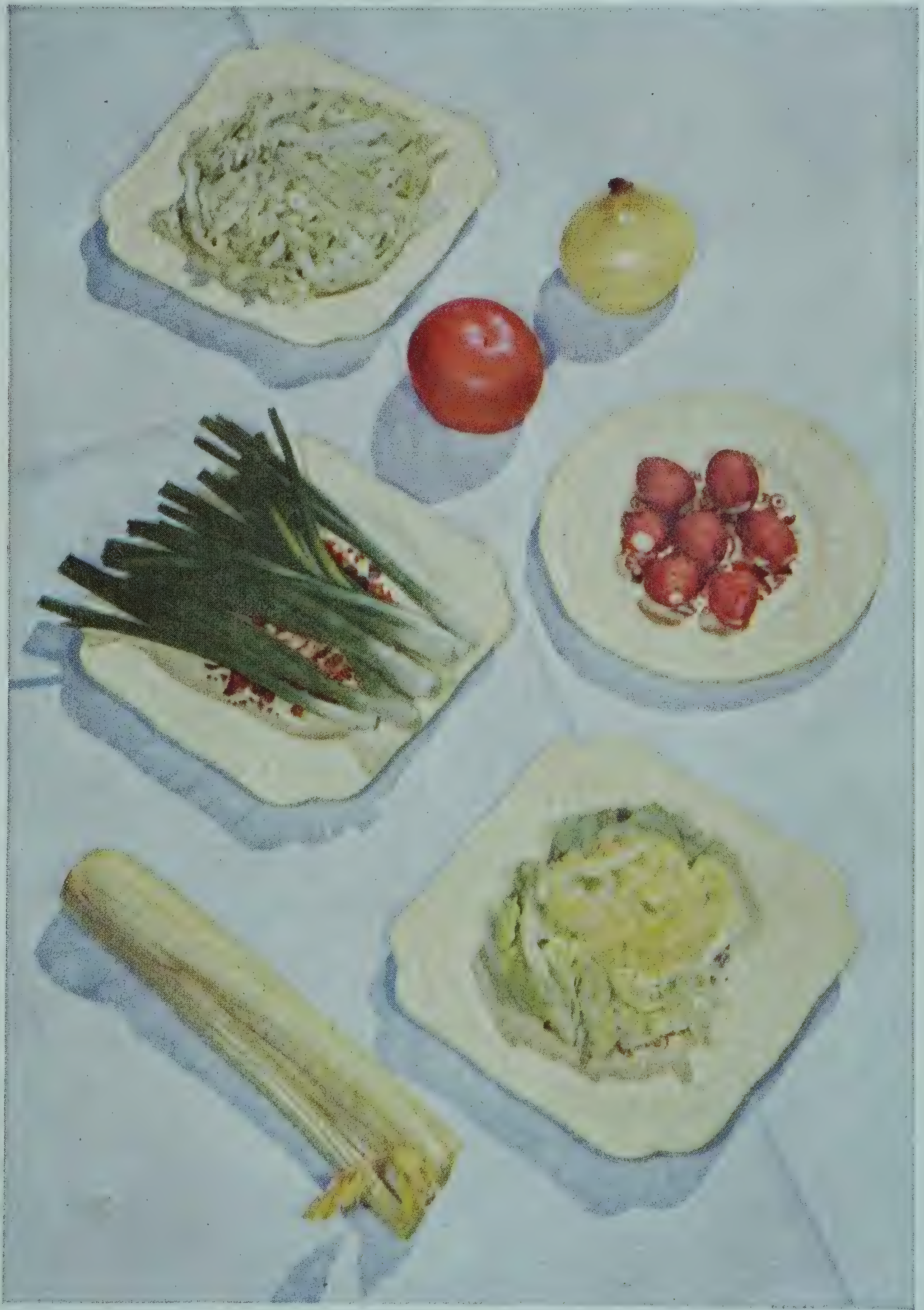
COMPARATIVE SERVINGS OF MEAT

eats, Fish and Poultry:	*Gram Weight*	*Household Measure*
Sliced chicken	75	2½ oz. edible portion
Broiled chicken	75	2½ oz. edible portion
Ham	75	2½ oz. edible portion
Fish	75	2½ oz. edible portion
Lamb chop	75	2½ oz. edible portion
Pork chop	75	2½ oz. edible portion
Sweetbreads	75	2½ oz. edible portion
Liver	75	2½ oz. edible portion
Roast beef	75	2½ oz. edible portion
Beef tenderloin	75	2½ oz. edible portion

COMPARATIVE SERVINGS OF VEGETABLES

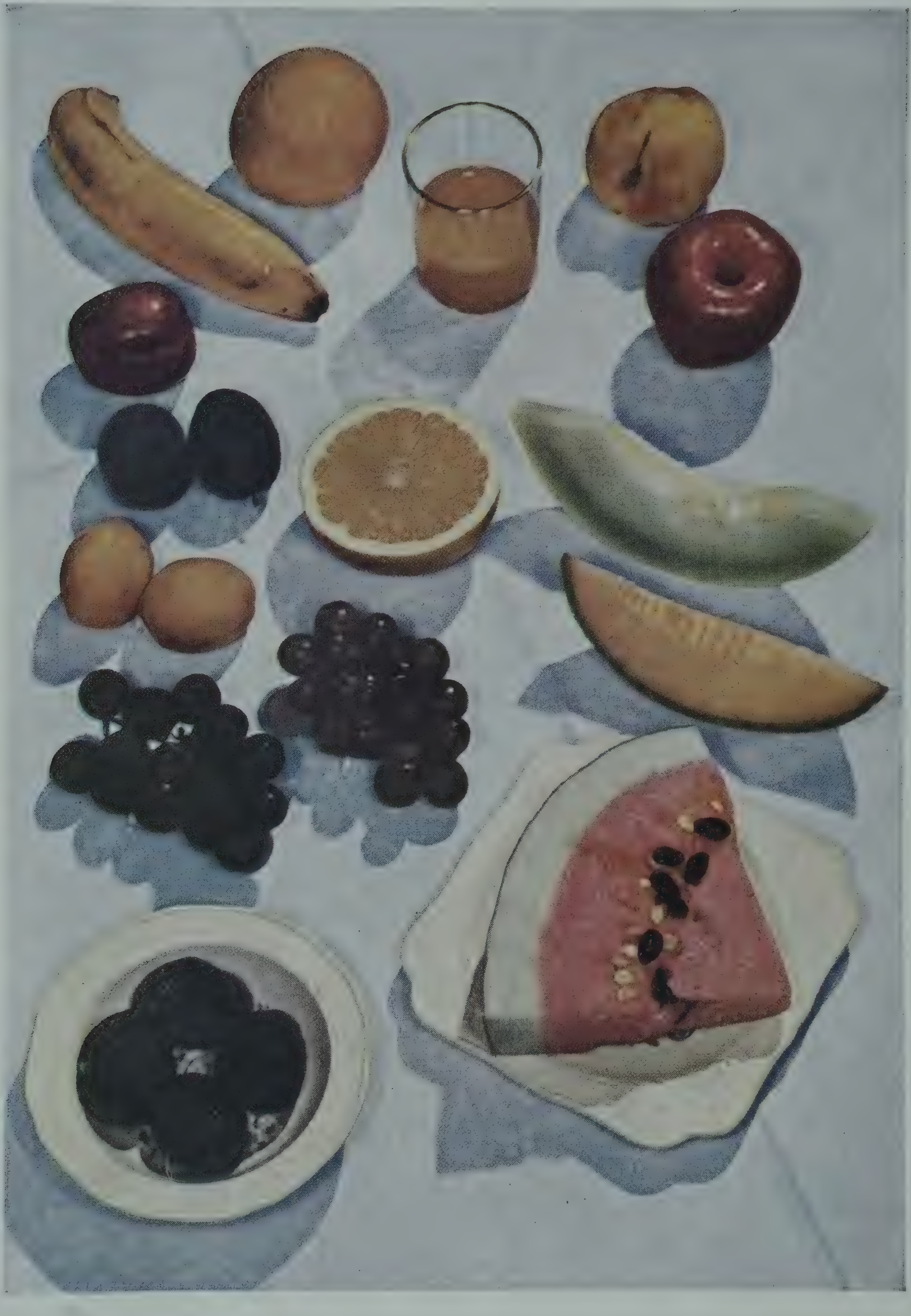
Vegetables:	*Gram Weight*	*Household Measure*
Raw:		
Cabbage, shredded	50	⅔ cup
Celery	50	1 medium-size heart; 2 medium stalks; ⅜ cup or scan ½ cup diced
Cucumber, sliced	50	⅔ cup
Lettuce	50	⅙ medium-size head; ¼ small head
Radish	50	5 medium (1 inch in diameter
Tomato	100	1 medium
Water cress	25	¾ cup
Green olive	20	3-4
Ripe olive	20	3-4
Green onion	50	8-10 small
Cooked:		
3 per cent	100	½ cup
6 per cent	100	½ cup
15 per cent	100	½ cup
20 per cent:		
Potato	100	½ cup diced or mashed, o 1 medium baked
Green corn	100	⅜ cup; scant ½ cup
Shelled bean	100	½ cup

PLATE 7



Comparative servings of vegetables: cabbage, tomato, onion, green onions, radishes, celery and lettuce.

PLATE 8



Comparative servings of fruits (approximately 100 Gm.): banana, orange, orange juice, peach, apple, plums, grapefruit, honeydew melon, apricots, cantaloupe, grapes, watermelon and prunes.

COMPARATIVE SERVINGS OF FRUIT

Fruit:	*Gram Weight*	*Household Measure*
Raw:		
Orange	100	1 medium
Grapefruit	100	½ medium
Cantaloupe	100	¼ medium, ⅛ large
Apple	100	1 small
Fruit juice	100	½ glass
Peach	100	1 medium
Honeydew	100	⅛ small
Watermelon	100	¼ slice 2 inches thick
Banana	100	1 small, ½ large
Plum	100	1 large, 2 small
Apricot	100	2 large
Grape	100	1 small bunch
Pear	100	½ large
Berry	100	½ cup
Cooked:		
Apricot	100	3 halves with juice
Berry	100	½ cup with juice
Pear	100	½ medium with juice
Peach	100	½ large with juice
Prune	100	4 large with juice
Cherry	100	½ cup with juice
Applesauce	100	½ cup, scant

A FEW SUGGESTED SUBSTITUTIONS

A few of the more common substitutions that may be used in all the diets, in which no special attention is given to substitutions, are listed below. These substitutions may be interchanged insofar as they do not affect the essential food requirements of all diets as discussed on pages 54 to 57.

1. In place of one egg, one of the following may be had:

Milk	1 glass
Milk soup	1 cup
Cottage cheese	2 tablespoons
Solid cheese	1-inch cube
Soft cream cheese	1½-inch cube
Custard	½ cup
Meat	½ serving (1 oz.)

2. In place of one serving of potato (100 Gm.), one of the following may be had:

Cereal	⅔ cup cooked or prepared
Bread	1 slice
Macaroni, spaghetti or the Italian pastes	⅔ cup cooked

3. In place of one slice of bread (weighing 1 oz.), one of the following may be had:

Cereal	½ cup
Potato, cooked spaghetti, noodles	⅜ cup
Corn or cooked dried beans	⅜ cup
Flour, white or whole-wheat	2¼ tablespoons
Peas or parsnips	½ cup
Apple	1 medium
Crackers, saltine	5 crackers
Crackers, soda	3 crackers (3 squares)
Crackers, graham	3 crackers

4. In place of one square of butter (10 Gm.), one of the following may be had:

Salad dressing with oil	2 teaspoons
Cream, 20 per cent	3 tablespoons

5. In place of two slices of crisp bacon, one of the following may be had:

Butter	½ square
Cream, 20 per cent	2 tablespoons

6. Clear meat broths and consommé have no food value and may be used in any of the diets as desired unless they are specifically mentioned in the typical foods to be avoided.

METHOD OF CHANGING DIET PRESCRIPTIONS

In this book the author has presented skeleton outlines of diets with definite amounts of protein, fat and calories. The amounts of protein or the calories prescribed in the various diets for each condition may not quite meet the needs of the individual case at hand in all instances. When this occurs and the condition is one in which no special suggestions of a method of altering the prescription have been given, the following few changes are suggested.

SUGGESTIONS FOR CHANGING PROTEIN AND CALORIC CONTENT OF DIETS

The protein content may be increased or decreased by adding to or subtracting from the diet certain protein foods. For example:

One egg gives 6 Gm. of protein and 6 Gm. of fat.

One one-inch cube of American cheese gives approximately 6 Gm. of protein and 7 Gm. of fat.

One small serving of meat (1½ oz.) gives approximately 11 Gm. of protein and 7 Gm. of fat.

The caloric content may be increased or decreased by adding to or subtractin from the diet the fats or carbohydrate, o both. For example:

One square of butter (10 Gm.) give approximately 75 calories.

One tablespoonful of salad dressin made with oil is approximately 120 cal ries.

One teaspoonful of sugar, lactose, jell or jam gives approximately 20 calories.

PART III

DIET IN DISEASE

Diet in Disease

We well realize the many divergent opinions that exist today in the field of diet therapy. However, in the past decade there has been a gradually increased acceptance by the majority of physicians of certain general basic principles of diet therapy in an increasing number of diseases, especially those in which diet is of paramount importance. In certain other conditions in which diet is prescribed, there are great inconsistencies and still a wide divergence of opinion.

In Part II we have discussed our method of calculating all the diets presented, have given our conception of servings to be used or indicated in the diets outlined and have listed a few suggested substitutions.

In Part III we will attempt briefly to show the practical application of all the foregoing principles to the problem of selecting the food needed for the treatment of each individual case.

The discussion of diet in disease is divided into two sections as outlined below: Section A, diseases in which diet is of paramount importance; Section B, those conditions in which diet is of varying importance.

Our aim is to give a brief definition of the nature of each disease and the object of the diet. We then discuss the chief points in dietotherapy in relation to that disease, with the idea of providing the reader with a quick review of the specific principles involved in the disease at hand from a dietary standpoint.

Every individual has to meet special problems and unexpected emergencies, and the various diets outlined in each disease have been presented with the individual in mind. An effort has been made to allow enough variation so as to give the doctor and the dietitian an adequate outline to meet the needs of each patient.

It is not intended that these diets be used as a stock or printed list for a particular disease and applied to all patients afflicted with the disease, irrespective of particular needs. The greatest fault of dietetics today is the attempt to use a standard list for each disease for all patients.

Section A

Diseases in Which Diet Is of Paramount Importance

Metabolic Diseases:
- Diabetes Mellitus
- Gout
- Overweight–obesity
- Underweight–emaciation

Nephritis:
- Chronic Nephritis Without Complications
- Acute Nephritis
- Chronic Nephritis with Edema
- Nephrosis
- Renal Arteriosclerosis
- Uremia

Diseases of the Digestive Tract:
- Peptic Ulcer
- Constipation

Deficiency Diseases:
- Food deficiency and chronic disease
- Xerophthalmia–night blindness, lack of vitamin A
- Beriberi–certain forms of peripheral polyneuritis, lack of thiamine
- Pellagra, lack of nicotinic acid (niacin)
- Ariboflavinosis, lack of riboflavin
- Scurvy, lack of ascorbic acid
- Rickets, lack of vitamin D
- Tetany–osteomalacia–spasmophilia, lack of calcium
- Hypovitaminosis E, lack of vitamin E (tocopherol)
- Hemorrhagic disease of the newborn–certain hemorrhagic states, lack of vitamin K
- Nutritional edema, lack of adequate protein
- Simple goiter–hypothyroidism, lack of iodine
- Macrocytic anemia–deficiency of antianemic factor in liver
- Related macrocytic anemias
- Pernicious anemia
- Sprue
- Hypochromic, microcytic anemia–iron deficiency

Metabolic Diseases

DIABETES MELLITUS

Nature of the Disease

Impairment of islet cells of pancreas

Object of Diet

To adjust carbohydrate intake, with or without insulin, within body's tolerance

Diabetes mellitus is a disease of metabolism in which there is a decreased secretion of the hormone insulin from the islet cells of the pancreas. The normal ability of the body to utilize carbohydrates is more or less impaired and sugar is excreted in the urine. The principal symptoms are a marked increase in the desire for water, appetite for food and the amount of urine voided. In spite of increased food intake, the patient loses weight and strength.

Important Factors in Dietary Treatment of Diabetes Mellitus

1. Calories: Sufficient to maintain normal weight; overnutrition being avoided
2. Carbohydrate: Restricted, but fairly liberal
3. Protein: Adequate, normal amount
4. Fat: Enough to meet caloric needs

These important factors need some further discussion:

Calories: Sufficient to Maintain Normal Weight, Overnutrition Being Avoided. The caloric value of the diabetic diet should be so arranged that enough food is given to maintain a weight slightly below normal. Joslin and others have emphasized that obesity predisposes toward diabetes, and overweight patients should be reduced gradually. The diabetic patient is much better off if he is kept slightly below normal in weight. The intake of food must be adequate to meet his energy requirements, so as to prevent his drawing on his own tissue fat and protein. The caloric needs of the diabetic patient are established from the weight, the height, the age and the sex of the patient and the determination of the ideal weight. If the patient is overweight, the calories of the diet should be so reduced as to enable him to lose weight sufficiently to attain a normal weight. If his weight is normal, he should be given the calories necessary to maintain it. If he is undernourished, sufficient calories should be added to make him gain. A tendency to undernutrition rather than to overnutrition underlies all diabetic therapy. No one wishes a diabetic to be above the normal in weight. Few wish the weight to be much below normal, save in early middle life and later, when a minus weight of 20 lbs. or more is conducive to longevity and to the prevention of the onset of diabetes.

Carbohydrate: Restricted but Fairly Liberal. In present-day treatment of diabetes mellitus, an attempt is made to give an amount of carbohydrate which, comined with the glucose derived from the ther food factors of the diet, will allow or a fairly normal, adequate and palatble diet. This means that the carbohyrate should be somewhat restricted—to hat amount which the individual patient an utilize without excreting sugar in the urine. If the tolerance is so low that a fairly liberal amount of carbohydrate cannot be given without glycosuria, then insulin should be given. The carbohydrate allowance should be from 2 to 3 Gm. per Kg. of normal body weight. We use from 100 to 200 Gm. of carbohydrate, depending upon the individual patient. Occasionally, one can give even more than 200 Gm. of carbohydrate, but we believe that a diet below 150 Gm. or over 200 Gm. is still in the experimental stage. In no circumstances do we use diets containing less than 100 Gm. of carbohydrate in 24 hours, and seldom under 150 Gm. Many normal adults do not care for more than 200 Gm. of carbohydrate. The effects of such higher diets or uncontrolled carbohydrate diets upon diabetic children at the end of twenty years are just beginning to be understood. It is our opinion that the average patient, even if originally allowed a high carbohydrate diet, later restricts it at least to the neighborhood of 200 Gm., and we must say that those who fail to do so usually likewise fail to control their diabetes. Similarly, patients started on less than 150 Gm. of carbohydrate often fail to follow their diet.

Protein: Adequate, Normal Amount. The protein in the diet of a diabetic is practically the same as that advised for a similar nondiabetic individual. It varies not only according to age but also according to the patient's activity and the condition of the renal and the digestive tracts. It is generally recognized that the diabetic requires an amount of protein equal to the normal and may be given that amount without upsetting his diabetic management. This means that an adult diabetic should be given approximately 1 Gm. of protein per Kg. of body weight. A growing child should receive from 2 to 3 Gm. of protein per Kg. of body weight.

Fat: Enough to Meet Caloric Needs. On the basis of our recommendation for the amount of carbohydrate and protein to be provided in the diet, the calculation for fat becomes very simple: it should be given to the amount of the balance of the total calories after providing for carbohydrate and protein. Fat meets energy requirements and maintains normal body weight for the individual patient.

Objectives in Treating Diabetes Mellitus. Objectives in the treatment of diabetes are the maintenance of comfort, vigor and reasonable weight within the normal zone or very slightly below it, and the control of glycemia and glycosuria. Although all agree that chemical meticulousness is to be avoided in an effort to prevent exposure of the patient to hypoglycemic reactions, the nearer normal the proportions of carbohydrate, protein, and fat are in the diabetic diet, the better it will be for the patient. Care of course should always be taken to avoid glycosuria, hyperglycemia and hyperlipemia, as well as avitaminosis and deficiency of minerals. If the patient's tolerance is unable to cope with the amount of carbohydrate, protein and fat in the diet prescribed to accomplish the caloric need as above outlined, then insulin should be used. The diabetic patient must be taught the nature of diabetes, how to take advantage of diet, insulin and exercise in its treatment, and how to prevent or combat the common complications of the disease.

If the diabetic follows the rules of treatment and gives his doctor an opportunity to examine him thoroughly three or four times a year, there is no reason why he should not live as long as the nondiabetic.

INSULIN AND ITS REGULATION*

All of us require insulin, and if we cannot manufacture what we need in our own pancreas, we are fortunate in that we can secure it by purchase or gift. None of us, the normal or the diabetic, knows the quantity required to maintain health and strength. Nature regulates the supply with surprising accuracy, balancing its production with the carbohydrate consumed, whether this is for prompt utilization or storage, and adjusting its output to the momentary demands of exercise or rest. In unusual circumstances, too much insulin may be produced; so much at times that this may result in hypoglycemia, if it is not compensated for. Probably at other times all of us experience symptoms from an increased production of lesser degree which we recognize in ourselves by hunger and fatigue. It is difficult to decide whether these states are actually due to too much insulin or too little carbohydrate through lack of body glycogen.

Insulin is an extract of fresh pancreatic tissue and is a hormone which regulates sugar utilization in the body. It has revolutionized the outlook for patients with diabetes. It increases rather than minimizes the importance of accurate dietary control which, prior to the discovery of insulin, was the only form of treatment available. If the diabetic patient is to do justice to his health, he cannot be careless with either his diet or his insulin. Whether he is on diet treatment alone or on insulin and diet control, he should make an effort to keep sugar-free, as determined by his own analysis of his urine.

As little insulin as possible should be used and as limited a number of injections as will allow the patient a palatable and adequate diet and attempt to keep the urine free of sugar throughout twenty-four hours. The dose of insulin, of course, depends on the diet used and the patient's native tolerance. In moderately severe cases, from 10 to 30 units a day are required. It is seldom necessary to use more than from 50 to 60 units a day, unless the physician follows the high-carbohydrate principle or complications exist.

TYPES OF INSULIN

There are two types of insulin: the quick-acting regular or crystalline insulin and the slow-acting insulins, protamine zinc insulin, globin insulin and insulin mixtures. At present we use protamine zinc insulin in about 70 per cent of all patients requiring insulin; globin insulin in about 15 per cent, and either supplementing protamine zinc insulin with crystalline insulin or insulin mixtures in the remaining 15 per cent when difficulties in adequate control make it necessary. Both types of insulin are given in the morning before breakfast, with usually no more insulin for the rest of the day.

REGULAR OR CRYSTALLINE INSULIN

The expression unmodified insulin, or simply regular insulin, is used in referring to aqueous solutions of the active antidiabetic principle of the pancreas, such as have been in common use since 1922. Crystalline insulin was based upon the work of Abel and was commercially introduced because this form was believed to be purer. This insulin, of course, is a quick-acting insulin; it depresses the blood sugar level to its maximum within a matter of an hour and then gradually returns to normal level of hyperglycemia which existed prior to the injection of the regular insulin. In diabetic patients eating meals at the usual hours, the maximal total effect of regular or crystalline insulin taken before breakfast extends over a period of from 3 to 5 hours after injection. Crystalline insulin is a purer substance than regular insulin, lasts longer and costs no more. Crystalline insulin and protamine zinc insulin are the insulins now perhaps used more than any other insulins. The time required to shift from regular or crystalline insulin to protamine zinc insulin or globin insulin depends upon the severity of the case of diabetes and varies from 3 to 10 days. If dependence must be placed on a quick-acting insulin alone (crystalline or regular insulin), it is quite possible in a mild case of diabetes that one injection daily would be sufficient. It is usually best to give that dose before breakfast. If two doses are necessary, doses before breakfast and supper are given. If a third dose is required, that is best administered upon retiring. If a dose of regular insulin is given at bedtime, it must be relatively small—2, 4 or 6 units in order not to provoke a hypoglycemia.

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* The expression unmodified insulin, or simply insulin, is used in referring to aqueous solutions of the active antidiabetic principle of the pancreas, such as have been in common use since 1922. The designation protamine zinc insulin is used in referring to preparations of the principle modified by the addition of protamine and zinc.

PROTAMINE ZINC INSULIN

The protamine zinc insulin which was made commercially available represented a great step forward in the practical therapy of diabetes. Many attempts were made to retard the effect of insulin—to obtain an insulin that was slower but more prolonged in its action. The most successful compound thus far prepared is precipitated insulin protaminate with zinc chloride added in a concentration of .008 per cent. This is the equivalent of 0.2 mg. of zinc chloride per 100 units of insulin. Protamine is a simple protein that possesses the property of precipitating protein. Insulin, of course, is a protein. Hagedorn selected the monoprotamine from the sperm of Salmo Irideus for precipitating insulin, because this precipitate has the lowest solubility of all the protamines. Insulin protaminate produces a longer insulin action than the same dose of ordinary insulin as a result of the slow liberation of the insulin molecule from this poorly soluble compound. In diabetic patients eating meals at the usual hours, the maximal total effect of protamine zinc insulin taken before breakfast extends over a period of from 12 to 24 hours after the injection. Some observers have recommended the division of the protamine insulin into two doses, given at intervals of 12 hours. Others have resorted to the administration of a dose of regular insulin twice a day along with protamine insulin. It seems to us that the advantage of the protamine preparation is lost if more than one dose a day is given, except perhaps in the severest cases of diabetes. The patient should be instructed always to carry small cubes of sugar or a piece of candy with him and to take one at the first suggestion of any unusual symptoms of hypoglycemic reaction and another one every 20 to 30 minutes, if needed, until the next meal if symptoms persist or recur. The time of reaction in the use of protamine zinc insulin is almost uniformly in the early morning hours, between five and eight o'clock. The reason for these reactions is that it is almost impossible to predict or anticipate the duration of the protamine insulin effect with the same degree of accuracy as with unmodified insulin. Acute infections of any kind in a diabetic promptly break the carbohydrate tolerance by depressing the native insulin-secreting mechanism. It has been demonstrated that circulating toxins have a profound inactivating influence on insulin action. For example, the severe diabetic who is controlled with protamine insulin and suddenly develops a respiratory infection experiences a depression in his tolerance of an order sufficient to require an increase of protamine zinc insulin to alarming proportions. We have found it advisable in these cases to continue the protamine insulin in the same or slightly increased doses and to supplant it with unmodified insulin in divided doses, the amount depending upon the degree of glycosuria and associated infection. It has often been observed that one who has recently developed the disease will show a marked and progressive increase in carbohydrate tolerance shortly after starting treatment. In from four to six weeks the true level of his tolerance will generally become stabilized and subsequently remain fairly constant.

GLOBIN INSULIN

Since the introduction to the market of slow-acting protamine zinc insulin in 1937, many attempts have been made to modify and improve its action. These investigations have been stimulated primarily by the recognition that from one fourth to one third of the patients using protamine zinc insulin need a supplementary injection of a quick-acting insulin, such as crystalline or regular insulin, in order to ensure a satisfactory blood sugar in the early part of the day. This is necessitated by the slow initial effect of protamine zinc insulin. Globin insulin appears to hold an intermediate position in the scale of duration of action between regular unmodified or crystalline insulin and protamine zinc insulin. Globin insulin is prepared by combining insulin with globin, a simple protein obtained from beef erythrocytes. The market preparation contains 3.8 mg. of globin and 0.3 mg. of zinc per 100 units of insulin. Globin insulin is a clear aqueous solution. It is an acid solution maintained at PH 3.7 with cresol added as a preservative. It appears to be a stable solution at room temperature, but the preparation should be used only if it is perfectly clear. Experimental and clinical studies indicate that the rate and the drop of blood sugar following its administration are slower than in the case of unmodified insulin. The lowering effect on the blood sugar of the globin insulin, as compared with unmodified insulin, is characterized by a slower rate of drop and a longer period of action. It does not possess as long a period of action as protamine zinc insulin. If there is any tendency to a hypoglycemic reaction from the use of globin insulin, that reaction generally occurs between three and four o'clock in the afternoon. In diabetic patients eating meals at the usual hours, the maximal total effect of globin insulin taken from about one half to three quarters of an hour before breakfast extends over a period of from 6 to 8 hours after injection. The first clinical report published by Bauman, in 1939, pointed out, first, that owing to its shorter action, globin insulin was less apt than protamine zinc insulin to produce hypoglycemia during the night; second, that there was an apparent lack of local allergic reaction to this preparation; and, third, that while mild and moderately severe diabetics were moderately controlled, severe diabetics were only fairly well regulated with globin insulin. Its total action lasts from 18 to 24 hours and usually permits a normal fasting blood sugar. The initial action is not as great as with crystalline insulin. A moderate rise in blood sugar occurs between 7 A.M. and 11 A.M. This may be less if the insulin is taken from 45 to 60 minutes before breakfast. There is a tendency for a large, rapid fall in blood sugar between 2 P.M. and 5 P.M., with a marked tendency to insulin reaction unless an afternoon lunch is taken. Patients taking globin insulin, therefore, should have a serving (100-Gm. portion) of 15 per cent fruit at about three or four o'clock. A bedtime lunch is best omitted to avoid a hyperglycemia at night. Although globin insulin will control adequately the blood sugar of mild and some moderately severe cases, its action is not satisfactory for the severe cases.

INSULIN MIXTURES

Of interest have been a series of experimental investigations in which crystalline insulin and turbid protamine zinc insulin were mixed in order to obviate the necessity of administering two separate doses of insulin to the severe diabetic. The first important practical contributions which made insulin mixtures clinically feasible were presented by Peck and by Colwell. When crystalline insulin is mixed with turbid protamine zinc insulin, the result, according to Colwell, is an insulin with a monophasic action which is more prompt and intense and with less prolonged activity than commercial protamine zinc insulin. Colwell believes that fully 85 per cent of diabetic patients requiring protamine zinc insulin supplemented with regular or crystalline insulin can be satisfactorily regulated on a single dose of the two-to-one mixture (two parts of crystalline insulin to one part of protamine zinc insulin) and that 97 per cent can be well regulated by use of some insulin mixture. According to Peck, mixtures made of equal parts of crystalline insulin and protamine zinc insulin do not show a significantly different action from that obtained when using protamine zinc alone, whereas combinations containing more than three parts of crystalline insulin to one part of protamine zinc insulin are not active long enough and show too great an intensity of effect during the day. Of all the suggested insulin mixtures, practical clinical experience thus far indicates that the most useful mixtures are those prepared in the ratio of two parts of unmodified insulin to one part of protamine zinc insulin; or, three parts of unmodified insulin to two parts of protamine zinc insulin. The outstanding advantage of insulin mixtures is that one injection only is needed in patients who might otherwise require protamine zinc insulin supplemented with crystalline or regular insulin, and Colwell believes its waning action during the night lessens the danger of nocturnal hypoglycemia. A disadvantage, however, is the difficulty encountered when the patient attempts to mix the two insulins in a syringe before injection. Although the more intelligent and more dextrous patient may do this correctly following careful instruction, many patients will undoubtedly make errors. Before shifting a patient to an insulin mixture, the physician should have an accurate concept of the patient's carbohydrate tolerance. We suggest the two-to-one mixture if the insulin mixture is to be employed, and the total number of units used should be the same as in the case of any previous insulin the patient has been on, provided the patient has been stabilized in his diabetic control for a reasonable period of time. It is very important that the patient be taught every exacting detail of the technic of mixing the insulins. The following instructions have proved to be of value to him:

1. Draw up air in the syringe to the unit mark.
2. Inject the air into the regular insulin bottle and withdraw insulin to the unit mark. Then withdraw needle from the insulin bottle.
3. Hold the syringe with needle pointing downward. Draw air into syringe until piston reaches unit mark.
4. Shake the protamine zinc insulin bottle vigorously.
5. Insert needle in the bottle of protamine zinc insulin and inject the *air only* into the bottle. Withdraw protamine zinc insulin to the unit mark *very slowly*.
6. Draw an air bubble into syringe and mix thoroughly.
7. Hold syringe perpendicularly, needle pointing upward, and expel the air bubble.
8. You are now ready to administer the insulin mixture.

DOSAGE OF INSULIN

The more severe the case of diabetes, the larger the amount of insulin needed to utilize a given quantity of dextrose. Insulin is given to aid in the utilization of dextrose in the body. Clinically, it has been observed that the total diabetic who is in acidosis or coma is capable of utilizing from approximately 1½ to 2 Gm. of glucose per unit of insulin administered. He is the individual who has practically no endogenous insulin. On the other hand, it is true that the partial diabetic, who is capable of utilizing dextrose by virtue of some of his own functioning insulin, does not require as much exogenous insulin as the total diabetic for utilizing the same amount of carbohydrate. It is obvious, therefore, that the milder the diabetic, the more glucose will be utilized per unit of insulin administered. When a severe diabetic gradually has his acidosis compensated for, he will be able to utilize from approximately 2 to 3 Gm. of glucose per unit of insulin administered. If the patient is a mild diabetic with no ketonuria or complications, he will be capable of utilizing from approximately 5 to 7 Gm. of glucose per unit of insulin administered. The number of grams of carbohydrate that one unit of insulin will metabolize is a question no one actually can answer. Adjustments for exercise and diet are always required. Even if these two factors are constant, the improvement of the condition of the patient often alters one's calculations. Then, too, there are many complications in diabetes which affect the strength of the unit. The depressing effect of infection upon the power of insulin is well known. Acute infections of any kind in a diabetic promptly break the carbohydrate tolerance by depressing the native insulin-secreting mechanism. It has been demonstrated that circulating toxins have a profound inactivating influence on insulin action. For example, the severe diabetic who is controlled with protamine insulin and suddenly develops a respiratory infection experiences a depression in his tolerance of an order sufficient to require an increase of protamine zinc insulin to alarming proportions.

Because from about 80 to 90 per cent of all cases of diabetes mellitus requiring insulin can be controlled by one daily injection of protamine zinc insulin, it is naturally the insulin of choice. It is not intended to replace unmodified insulin in dealing with acidosis and emergencies.

The most satisfactory time for injection of protamine zinc insulin, either accompanied or unaccompanied by treatment with unmodified insulin, is a matter which the attending physician must determine for each patient. Each case requires individual management. In many instances a period of watchful observation under laboratory control, with frequent blood sugar estimations and urine examinations, will be required before a proper readjustment of the blood sugar level can be satisfactorily accomplished. It is important for the clinician to realize that a period of several days may elapse before the full therapeutic effect of protamine zinc insulin is evident.

Too rapid increase in doses of protamine zinc insulin during this initial period may result in a period of prolonged hypoglycemia. Treatment must obviously be directed on the understanding that the final result will not be apparent for from two to three or more days, and in severe cases it may be several weeks before satisfactory control is attained.

The injection of protamine zinc insulin before breakfast, followed or accompanied by a separate dose of unmodified insulin in those severe cases which require it, is the method which at present is more favored in the United States. Campbell, Fletcher, Kerr and Wilder pointed out the advantages of this course, and Joslin and his associates and many others have also found it efficacious.

In long-standing cases of diabetes previously treated with insulin, the substitution of protamine zinc insulin for unmodified insulin is not so simple. It may be made gradually by beginning with a small dose of protamine zinc insulin and increasing this as the dose of unmodified insulin is decreased, or abruptly by replacing the entire insulin dosage by one injection of protamine zinc insulin daily. Usually the amount of protamine zinc insulin required is from about two thirds to equal the number of units in the patient's former total daily dose of unmodified insulin. During the first few days of substitution it is important to keep in mind that in this initial period, doses of unmodified insulin may be required until the slow, prolonged action of protamine zinc insulin has become established. In such instances the injection of both protamine zinc insulin and unmodified insulin may be given at the same time, but at different sites. From several days to several weeks may be required for satisfactory readjustment. If sugar appears in the late forenoon, more unmodified insulin is needed, but if the urine is sugar-free when the patient rises in the morning, the dose of unmodified insulin may have to be decreased. If sugar appears later in the day or was evident when the patient arose in the morning, the dose of protamine zinc insulin may be increased. If glycosuria continues, the dose of protamine zinc insulin should be increased at three-day intervals until the urine becomes sugar-free. Too rapid increase may result in attacks of hypoglycemia which may be profound and prolonged. To prevent the occurrence of hypoglycemia in patients who are sugar-free, it seems necessary to determine the blood sugar levels at frequent intervals and to reduce the doses of protamine zinc insulin by from 3 to 5 units every day as long as the urine remains sugar-free or until optimum dosage has been finally established. For success in these cases, patience is a requisite, and in exceptional instances even from 3 to 4 months may be needed.

According to observations by Campbell, Fletcher and Kerr, diabetes of moderate severity requiring, for example, from 20 to 40 units of unmodified insulin divided into two doses daily can usually be controlled by a daily dose of from 20 to 40 units of protamine zinc insulin given in a single injection before breakfast; and in most severe cases, those having a requirement of from 60 to 100 units of unmodified insulin divided into three or four injections daily, a daily dose of from 50 to 60 units of protamine zinc insulin given in a single injection usually brings about fair control. In other words, not only can the daily dose be given in a single injection, but there is usually some actual economy in the number of units needed. In those cases showing some variation in the rate of action of protamine zinc insulin and a rise in blood sugar levels beginning before the expiration of the 24-hour period, the injection of from 40 to 50 units of protamine zinc insulin before breakfast, together with the injection of from 10 to 15 units of this product given at bedtime, has been considered to be more effective than the single injection. Rabinowitch, Fowler and Corcoran believe that the use of unmodified insulin as a supplement to protamine zinc insulin is usually undesirable.

We feel that from 85 to 95 per cent of the patients who are not controlled by a single injection of globin insulin, or protamine zinc insulin, even when supplemented by a dose of unmodified insulin, can be controlled by the use of a two-to-one insulin mixture.

Whatever plan of administration is adopted, it should be remembered that the full effect of treatment with protamine zinc insulin will not be evident until a week or two after its initial administration. Therefore, an increase in the dose need not be made because of slight hypoglycemia or slight glycosuria during the early period.

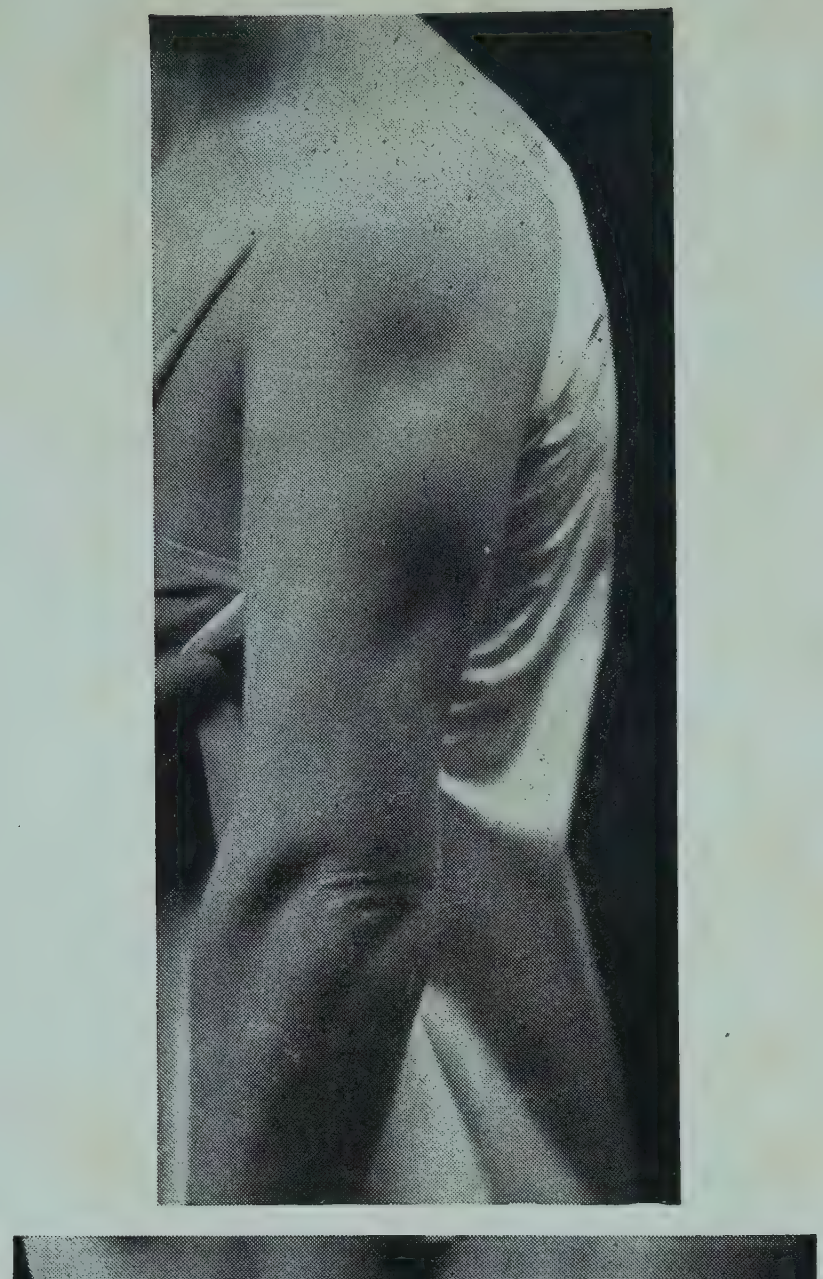
Care must be taken that the effect of any dose of regular insulin, protamine zinc insulin, globin insulin or insulin mixture is not cumulative with the effect of a preceding dose to the extent of inducing marked hypoglycemia.

As soon as the proper regimen of diet and dosage has been determined, no changes should be made except those indicated by periodic blood sugar and urinary sugar findings. Over a period of months it has been found that in certain cases a gradual decrease in the dose of any insulin may be found necessary.

In general, one unit of insulin will metabolize from 1 to 2 Gm. of carbohydrate and perhaps even from 3 to 6 Gm., or more. A more definite estimate is impossible, because we never know how many units the patient's pancreas is producing each day, or at the moment; therefore, it is dangerous to prescribe insulin in arbitrary or schematic fashion. As a rule, it is well to follow the method of trial and error, always erring on the side of low and frequent, rather than high and single, dosage.

Insulin Requirements of Severe Diabetics. When patients claim they require more than 80 units, or even 50 units, we suspect complications such as infection, acidosis, complicating disease of the endocrine glands other than the pancreas (the thyroid, the adrenal or the pituitary), destructive processes in the pancreas with marked encroachment on the insulin-producing tissue (as in cancer, hemachromatosis or acute pancreatitis), disturbances of liver function (a cirrhosis or the chronic passive congestion of cardiac decompensation), hemachromatosis or just plain ignorance or carelessness in the quantity and the quality of the diet. If

PLATE 9



Insulin fat atrophy: (top) of the left arm; (bottom) of the left thigh. (Barborka, C. J.: J.A.M.A., *87:* 1646.)

none of these factors is present, the physician should re-examine the patient on the basis of further differential diagnosis of causes of diabetes and only as a last resort consider that the patient may have insulin resistance. If a diabetic patient does not do well, there is always a reason. One must not blame insulin or the diet, or even exercise, but try to discover what the reason is.

Resistance to Insulin. From time to time since the introduction of insulin, reports have appeared regarding rare individuals for whom extraordinarily large amounts of insulin have been required in order to control the diabetic condition. In general, clinicians have not regarded an insulin dosage as extraordinarily high unless it exceeded 100 units daily. Cases should not be regarded as resistant to insulin unless a daily requirement of 200 or more units of insulin exists over a period of time.

COMPLICATIONS FROM USE OF INSULIN

Besides the simple complications of the insulin injection, such as might occur from any parenteral injection such as infection, subcutaneous abscess and implanted broken needles, there are certain complications peculiar to the action of the insulin itself. These include local fat atrophy, local fat hypertrophy and allergic sensitivity manifested by local and general urticarial reactions.

INSULIN FAT ATROPHY

The first instances of atrophy of subcutaneous tissue of patients treated with insulin were reported by the author in 1926 (Plate 9). In one case injections of insulin had been made in both thighs and the left arm; in the other they had been given only in the thighs. In both cases the atrophy was limited to the sites of injection. Neither patient had received proper instruction in the technic of administering insulin and one injection after another had been made in the same location. After instruction on the technic of injection, no further areas of atrophy appeared in either of these two patients. By insistence on varying the site of injection, the occurrence of these disfiguring lesions usually can be avoided. However, they have been encountered even with well-trained patients. The fat atrophy may occur after the use of any form of insulin and in any concentration. We have seen it in unmodified insulin injections, protamine zinc injections and globin insulin injections. The cause of this fat atrophy is unknown. Although several theories have been propounded, there still is no satisfactory explanation to account for this complication. It may be due, of course, to a low-grade inflammatory reaction which results in gradual, subcutaneous scarring and produces pitting.

INSULIN HYPERTROPHY

Another curious and rare complication of the insulin injection is the occasional case that develops a lipomatous mass at the site of the injection. This, likewise, has been seen in young cases who persist in repeatedly employing the same area for the injections. The histologic picture of these masses reveals hypertrophic fat tissue with only slight signs of inflammation. The areas resemble a lipoma, are soft, not tender, and not freely movable. The two common sites reported for the development of this fat hypertrophy are the posterior aspect of the upper third of the arm and the inner aspect of the thighs, just below Poupart's ligament. There is no known cause of this complication and, as in fat atrophy, it seems to occur in patients who are peculiarly vulnerable to such deformities. However, the hypertrophic areas seem to recede when the patient stops using the area. This is different from the reaction to fat atrophy, which generally remains permanent although injection at the site is stopped.

INSULIN ALLERGY

Allergic reactions to insulin have been seen in only a small percentage of diabetics treated with insulin. These reactions are quite characteristic of protein sensitization and have appeared in three different types of reaction. The first type is simply a mild, inflammatory reaction at the site of injection which reaches its maximal severity in from 12 to 24 hours and subsides in 1 or 2 days. This difficulty persists for the first few weeks of treatment, then the patient apparently becomes desensitized spontaneously and no further reaction occurs. The second type of reaction also is local, but more severe. The inflammation develops more quickly after each injection, it lasts longer and is associated with enough pain to necessitate remedial measures. Desensitization in this type can be effected either by multiple, graduated doses of insulin itself or by repeated injections of histamine, histamine phosphate being given in doses of 0.05 mg. twice daily on the first and second days, 0.075 mg. twice daily on the third day, and 0.1 mg. twice daily for 10 additional days. The third type of insulin allergy—which, fortunately, is extremely unusual—is a rather general systemic reaction occurring as a diffuse urticaria with edema of mucous membranes and circulatory and gastro-intestinal disturbances. Experience has demonstrated that most patients who are sensitive to insulin are sensitive to pork pancreas protein. Ordinary, commercial amorphous insulin is made from approximately 50 per cent pork pancreas and 40 per cent beef pancreas. We have found that the great majority of insulin-sensitive patients can tolerate beef pancreas insulin without experiencing local reactions. It is possible to secure in these sensitized patients pure beef pancreas insulin under the trade name of Special Insulin.

THE INSULIN REACTION

The true insulin reaction is due to hypoglycemia and occurs if the diet and the insulin doses are not properly balanced.

The sensations of a reaction are muscular weakness, slight trembling, drowsiness, followed by perspiration, hyperpnea, tachycardia and occasionally delirium. Recovery may be spontaneous. Otherwise, unless restorative measures are instituted, convulsions, coma and death may supervene. The most common time for insulin reactions is late morning, late afternoon or late evening. If no food is taken following a dose of insulin, a reaction may occur within an hour.

The general nutrition of the patient affects the likelihood of reactions and their severity. Undernourished individuals are prone to develop them, partly because of inadequate reserves of hepatic glycogen, but also because in undernutrition a small dose of insulin is more active unit for unit; also patients hypersensitive to insulin from insufficiency of the thyroid gland, the pituitary or the adrenal. Woodyatt has labeled a group of patients with unusually unstable blood sugar levels brittle cases. These patients pass rapidly from the condition of hyperglycemia, even with acidosis, to hypoglycemia, and back again. Such patients require most careful management, and with them severe reactions can be prevented only by accepting some degree of undertreatment and carefully avoiding aglycosuric urine. The condition in some cases seems to be attributable to instability of the autonomic nervous system. The patients behave as if the glycogen of their liver rhythmically, but not with any regularity, were released excessively and then bound too tightly.

Causes of Insulin Reaction. Errors in treatment that may be responsible for reactions are the following: (1) Injection of more insulin than is intended due to an error in filling the syringe; (2) indulgence in more exercise than usual; (3) irregularity in taking food, postponing meals, missing a meal, eating it incompletely, or vomiting part or all of the food; and (4) overemphasis on the importance of having continuously sugar-free urine, and therefore taking more insulin than is actually needed.

Antidote. Fortunately, the antidote for an insulin reaction is simple and effective. A few grams of sugar will ordinarily control the symptoms almost immediately. Orange juice, glucose, cane sugar, molasses, honey or candy generally bring about prompt relief. If the attack is sudden or very severe and the swallowing reflex is lost, a hypodermic injection of adrenalin (from 0.5 to 1.0 cc.) or pituitrin (1 cc.) should be given. This causes mobilization of sugar from the glycogen stores of the liver. As a result the patient may be able to swallow. All injections of adrenalin or pituitrin should be followed by giving sugar as soon as possible or all reserve of sugar may be exhausted and a more intense hypoglycemia be provoked. As a last resort, if other measures fail, pure sterile glucose solutions may be injected intravenously.

DIET

The advent of regular insulin, protamine zinc insulin, globin insulin or insulin mixtures has not changed the rule that every diabetic should avoid marked variations from normal expenditures of energy in work or exercise, and should faithfully follow a carefully planned course of diet. While it is true that minor deviations may be of less immediate consequence, the fact remains that the results are best when a properly prescribed regimen is adhered to closely. When unmodified insulin is used, doses are adjusted in relation to meals. When protamine zinc insulin is used, diet must be adjusted with the prolonged blood-sugar-lowering effect of the product in mind, and a redistribution of food among meals may therefore be desirable. In all diets in Series 1 to 7, the total glucose content per twenty-four hours is equally divided among the three meals. The obvious ideal is to have the food so apportioned that when the dosage of any insulin has been properly adjusted, the control effected will involve no undesirable hypoglycemia, hyperglycemia or glycosuria at any time of the day or night. When protamine zinc insulin is used alone, it is often advisable to give about a 100-Gm. serving of a 10 or 15 per cent fruit at bedtime. When using globin insulin, it is well to give a 100-Gm. serving of 10 or 15 per cent fruit some time between three and four o'clock in the afternoon. The purpose of these feedings is to help avoid tendencies to hypoglycemia.

EXERCISE IN TREATMENT OF DIABETES

The effect of exercise along with diet and insulin is so striking and beneficial that it is now accorded a definite and prominent place in the everyday treatment of diabetes. When there is an adequate supply of insulin, whether it is endogenous or exogenous in origin, exercise tends to lower the blood sugar. The patients themselves recognize the effect and make use of the principle. Unless an accompanying condition contraindicates activity, diabetic patients should not be kept in bed but be encouraged to take regular daily exercises. Through muscular activity, food tolerance improves and higher diet with smaller doses of insulin are possible. While diabetic children are in summer camps they show much lower insulin requirements as compared with their needs during the winter, when they are in school and relatively inactive. It is a matter of common knowledge that insulin reaction may follow unusual or strenuous exercise in the well-controlled diabetic.

Hypoglycemia

Hypoglycemic reactions following use of protamine zinc insulin are not so frequent as those following use of unmodified insulin. Reactions may occur, however, especially if an excessive dose is administered, or in the event of overexercise or a sudden change in diet. The symptoms are similar, whether the patient is receiving unmodified insulin or protamine zinc insulin. On account of the slower absorption of the latter product, however, the symptoms may be less definite than those following administration of unmodified insulin. Hence it is of utmost importance to understand that vague symptoms of fatigue, headache, drowsiness, lassitude, tremulousness or nausea require immediate attention. Weakness, sweating, tremor or nervousness may also develop. Any one of these symptoms calls for the prompt administration of some form of carbohydrate. (Candy or sugar should always be carried by the patient.) Reaction following the administration of protamine zinc insulin may be prolonged and may be repeated in spite of treatment, because of the continuing effect of the dose administered. A soluble and easily digestible carbohydrate should be used in treating such reactions —for example, corn sirup or honey with bread. It is advisable to provide additional carbohydrate such as soda biscuits and milk after the lapse of one or two hours, even though the response has been favorable. In severe reactions, it may be advisable to use from 15 to 20 Gm. of glucose in sterile solution intravenously and follow later by food. It should be emphasized that following the injection of protamine zinc insulin the time of onset of hypoglycemic reactions may be considerably later than is the case with unmodified insulin.

It is important that the patient adhere to the stipulated diet and time of meals. If a regular meal cannot be obtained, the carbohydrate allotted to the meal should be taken in the form of orange juice, sirup, candy or bread and milk, instead of making any change in dosage. If a meal is omitted because of nausea or vomiting, the urine should be tested every three or four hours. If sugar is being excreted at the regular time for the administration of insulin or protamine zinc insulin, the prescribed dose should be injected, but if the urine is sugar-free, neither preparation should be administered until sugar is again present.

When the morning administration of protamine zinc insulin is first commenced, it may sometimes be difficult to adjust the dose and the diet so as to avoid early-morning hypoglycemia. A light meal consisting of a glass of milk or a cup of tea with soda biscuits shortly before bedtime has been efficacious. Any such meals should be considered as forming part of the computed diet; should not be taken or omitted at will; and should be regarded as purely temporary expedients to be dispensed with when suitable adjustment of dosage has been attained.

As is well known, the elderly diabetic is more susceptible to vascular degenerative lesions than the nondiabetic. Hypoglycemic attacks in elderly patients carry the decided danger of precipitating vascular spasm and thrombosis in vessels that have undergone sclerotic degeneration.

PROCEDURE AND DETERMINATION OF TOLERANCE

There are two general methods available to determine the ultimate diet for a patient. The first method, we think, is preferable; that is, to begin with a diet of carbohydrate, 150 Gm., protein, 70 Gm., and fat, 80 Gm. (Series 3 Diet), then progress to higher values gradually and, as a rule, except in the case of children, end with the carbohydrate somewhere between 175 and 200 Gm., the protein between 70 and 80 Gm., and the fat between 80 and 140 Gm. These diets supply sufficient calories for an individual of from 60 to 70 Kg., 132 to 154 lbs.; at work in an office. By the second method one decides on the final diet for the patient, then adjusts the patient to it, with or without the help of insulin. Actually, both methods are combined when patients remain only a week in the hospital.

In the hands of a physician experienced in the technical details of diabetic management, almost any procedure to determine tolerance of a diabetic patient is satisfactory.

There is no routine method of procedure that proves effective in the first contact with a patient to determine his tolerance. One must bear in mind the history and the examination to judge the type, the degree and the severity of the diabetes, and these factors combined determine the initial procedure. It is a mistake for the physician to follow any plan routinely without considering the individual problem at hand or altering, if necessary, the procedure to meet each case. One must always bear in mind that the impression as to the mildness or the severity of any case may be misleading. For example, an apparently severe case with a low carbohydrate tolerance may show a gradual improvement and prove to have a very good tolerance after being placed on a properly adjusted intake. On the other hand, what appears to be a mild case with an apparently high tolerance may have a glycosuria that is very difficult to control, and this case may prove to be a severe type.

Three General Types of Patients. There are three general types of patients with diabetes mellitus that are ordinarily met with: first, the patient who is not acutely ill but who has a simple glycosuria without evidence of acidosis; second, the patient who presents evidence of glycosuria with a mild acidosis without symptoms of acid intoxication; third, the patient with extreme acidosis with impending coma or frank and fully developed coma.

The tolerance of the first two types of patients may be determined at or near the beginning of treatment. The third type requires a special procedure to control the acidosis before any attempt is made to determine the tolerance.

The first type of patient who is not acutely ill but who has simple glycosuria without evidence of acidosis may be treated as follows: Place him on one of the diets of Series 3, depending upon his caloric needs for maintenance of desired weight (pp. 122–129). If his urine becomes sugar-free, a diet may be chosen from Series 4 which allows 175 Gm. of carbohydrate. If no sugar is excreted, the diabetes may be mild enough so that diets from Series 5 to 7 may be followed, or even a simple qualitative restriction of the gross sugars and starches as suggested in the typical foods allowed and those to be avoided (p. 105).

If, on the other hand, the original effort to determine the tolerance on a diet of 150 Gm. carbohydrate suggested in Series 3 does not cause the urine to be sugar-free, insulin should be given (p. 88).

The second type of patient is one who presents evidence of glycosuria with a mild acidosis which is not severe enough to warrant the procedure outlined in cases with coma, threatened coma or complications of infectious, intercurrent diseases or surgical operations, and who can take food by mouth without difficulty. These cases are placed upon one of the diets in Series 1 to 3, but insulin must be given.

In order to determine the dosage of insulin, specimens of urine must be collected and examined for sugar and aceto-acetic acid before each meal and before each dose of insulin is given. Usually from 5 to 15 units in cases who have not been taking insulin or this amount in addition to the dosage that is being taken will control the acidosis in from 24 to 48 hours. Sufficient insulin to control the aceto-acetic acid is given, but not enough to eliminate sugar from the urine completely. No attempt should be made to estimate the tolerance until the acidosis is controlled. Then one should proceed as in the first type of case.

If, when using any one of the series of diets, a steady excretion of glucose per day occurs, one learns by the difference between the glucose supply of the diet and the glucose excreted in 24 hours the approximate number of grams utilized per day. In other words, one can estimate the apparent existing glucose tolerance or the power to burn glucose at the time observed. Having established this approximate tolerance, the probable dose of insulin necessary to control the glycosuria can be estimated, on the average, at about 1 unit of insulin per 1 to 2 Gm. of glucose steadily excreted.

The third type of patient is one with extreme acidosis with impending coma or frank and fully developed coma.

Procedure in Cases of Diabetic Coma. The treatment of patients with frank and fully developed coma and those with extreme acidosis and obviously impending coma requires special consideration. The clinical symptoms of impending coma and coma should be well known. Large amounts of sugar, diacetic acid and acetone appear in the urine. Muscular weakness and drowsiness, particularly with pain in the limbs, the back and the stomach, nausea, abnormal and deep respirations, flushed cheeks, dried and parched tongue and breath smelling strongly of acetone (fruity odor) are the cardinal signs. Unconsciousness and the development of the long; labored breathing known as the Kussmaul respiration follow. The management of this condition has been materially improved by the introduction of insulin. The detail of procedure varies with the experience of different clinicians. A good plan is as follows:

1. Administer Insulin. We use a method with little temporizing and quick action which is similar to that used by Woodyatt. An immediate decisive dose of insulin is given, on the average about 1 unit of insulin per Kg. of body weight (60 units per 60 Kg.). No buffer of sugar is given with or after the first insulin injection. At six-hour intervals following this first injection empty the bladder, test the urine for sugar and diacetic acid, give a dose of insulin and buffer this with one feeding of 400 Gm. of milk following the injection. The dosage at each interval is regulated according to the urine findings.

Not infrequently diabetic acidosis is complicated by urinary retention; therefore, unless urination is unimpeded, the bladder is catheterized and completely emptied once every six hours. Every specimen of urine obtained by catheter or by spontaneous voiding is examined at once for sugar and diacetic acid.

If at the end of the first six hours the urine test reveals sugar and diacetic acid, the original dose of insulin should be repeated. When at the end of any period the diacetic acid test has become faint or negative while sugar persists, the insulin dose should be reduced to two thirds or one half of the original dose, depending upon the degree of acid or sugar present. When at the end of two consecutive periods no diacetic acid is present and the sugar test is faint or negative, steps may be taken to place the patient upon one of the diets in Series 1, re-establish a regular three-meal schedule and reduce the number of insulin doses to two or three in the waking hours of the day.

In very severe cases it may be necessary to give 2 units of insulin per Kg. of body weight (120 units per 60 Kg.) for the first injection and then proceed as above.

In case the patient is unable to swallow, 15 Gm. of pure dextrose in a 5 per cent solution are given every three hours by retention enema. In extreme emergencies the intravenous injection of insulin and sugar may be resorted to. Only glucose of the greatest purity should be employed. It should be dissolved in freshly distilled water and administered with all the precautions necessary in making intravenous injections.

The fear of producing insulin reactions has occasionally been responsible for too timid a use of insulin. Serious damage may result from allowing a patient to remain in severe acidosis. If acidosis is not controlled immediately, the patient may sink into coma. It is better to give too much insulin than not to give enough. If one fears an insulin reaction he may examine the urine at three-hour intervals instead of six-hour intervals, and if the urine shows signs of becoming sugar-free, give from 50 to 100 Gm. of orange juice hourly to prevent this.

2. Stop all food except the 400-Gm. milk feeding as directed or in emergency needs orange juice and glucose if necessary.

3. Put patient to bed for rest, quiet and warmth. Use warm blankets, avoiding hot-water bottles, as they may cause burns.

4. Have patient drink at least one quart of fluid during every six hours—chiefly water, but include hot tea and coffee. If water is given too fast by the stomach or bowel there is danger of dilating one or both.

5. It may be necessary to:

(a) lavage the stomach with warm 5 per cent solutions of sodium bicarbonate;

(b) support the heart by digitalis, hypodermic injection of digifolin 1 cc. every hour for six hours. Digifolin has proved to be very effective and apparently does not provoke nausea as easily as the oral administration of tincture of digitalis;

(c) give from 300 to 400 cc. of water or warm normal salt solution once in six hours for several periods; or

(d) if the patient is vomiting or fails to retain enema, introduce water into the body through subcutaneous injections, such as physiologic salt solution.

TYPES OF DIETARY TREATMENT

The dietary management of diabetes mellitus has passed through many evolutionary changes. The present-day dietary treatment of the diabetic consists of giving carbohydrate, protein and fat in quantities which closely approximate the intake of a normal individual. The ideal diabetic diet is one in which the nutritional components practically equal what the normal organism requires.

Probably no disease deserves greater credit for stimulating sound interest and developing dietetics than diabetes mellitus. Diet was the only form of treatment prior to the discovery of insulin. Its discovery has only served to increase the importance of diet. The actual method of procedure for the regulation of diet in the diabetic patient is dependent on the severity of the diabetes and whether or not there is an associated acidosis or other complications. The diet varies from a simple qualitative restriction of carbohydrates to a quantitative weighed diet with or without insulin. Varied proportions of carbohydrate and fat are used by different clinicians, some using high fat and low carbohydrate, others high carbohydrate and moderately low fat with, of course, high doses of insulin.

Previous to the discovery of insulin it was necessary to limit the intake of food to meet the ability of the body to utilize it. With insulin it is possible to give an adequate diet even to the patient with the most severe diabetes. The problem at present is to determine the best way in which to maintain complete control of the disease, preserve good nutrition and yet permit the patient to maintain so far as possible a normal existence. The liberty which insulin gives in dieting has led to further diversity of treatment, and totally different plans are used by different authorities. Each plan has its advantages and disadvantages.

High Fat and Low Carbohydrate Diets. This high fat low carbohydrate regimen is mentioned only for its historical interest. Such a regimen at this time is not indicated. Petren's clinic in Sweden and Newburgh and Marsh in this country advocated the high fat diet. In this diet the carbohydrate and the protein are restricted to small quantities and fat is given in large quantities to supply sufficient nourishment. The treatment was started with diets containing approximately 15 Gm. carbohydrate, 10 Gm. protein and 90 Gm. fat. All patients were treated alike. The diet was then increased gradually until they received from about 38 to 40 Gm. carbohydrate, 28 Gm. protein and fat to make up 1,600 calories. Undernutrition in part explained the success of this treatment. The advantages of the plan were that glycosuria and hypoglycemia might be controlled with greater ease and insulin was needed only for a small percentage of severe cases. Insulin is troublesome and inconvenient, although not a hardship when life depends on it. Restricted diets, of course, get monotonous and may be deficient unless care is taken in selection of foods. In any case of diabetes it is the patient who is to be treated, not the disease.

High Carbohydrate Diets. Earlier clinicians found some advantage in the use of high carbohydrate cereal diets, such as von Noorden's oatmeal cure, and other so-called wheat, potato, rice and banana cures. These diets were really the forerunners of the starvation treatment of Allen.

More recently nearly normal diets with high carbohydrate have been advocated by Geyelin, Sansum, Blatherwick, Borden and others. This does not mean an unlimited amount of carbohydrate, but a practically normal diet with the omission of sugar and foods sweetened with sugar. The advantage is a more pleasing diet and a sense of well-being and physical fitness. The disadvantage is that more insulin is required, and expense may be a factor. There is also a greater difficulty in complete control of glycosuria with its possible deleterious effects on the prospects of recovery of pancreatic function. An improvement in sugar tolerance in patients living upon a high carbohydrate regimen has been reported by a number of authors.

Moderate Restrictions. Joslin and Woodyatt employ a type of treatment that strives for moderate undernutrition plus small amounts of insulin. Their aim is to give insulin if necessary and a diet of from 100 to 200 Gm. of carbohydrate, protein from 1 to 1.5 Gm. per Kg. of body weight and fat sufficient to provide about 30 calories per Kg. of body weight. They feel that when one incorporates more than 200 Gm. of carbohydrate, the diet must consist of foods whose carbohydrate content is likely to cause errors in dietetic control.

We feel that the best procedure is to avoid the extremes and adopt an intermediate plan; namely, restrict carbohydrate and protein moderately, giving a large enough amount to allow agreeable variety and incorporating the protective foods. The fat is used in amounts sufficient to meet the calories necessary to maintain weight slightly below normal. Probably this is the most commonly accepted type of dietary treatment today. The use of insulin is completely avoided in many cases with a moderate restriction of carbohydrate and yet no hardship is inflicted on the patient from the standpoint of palatability and satiety.

Diet Therapy in Elderly Persons and in Children. It may be stated in general that little alteration and readjustment of life habits and especially food habits should be made in patients after the age of 65 or 70. The diabetes mellitus having its onset in elderly people is usually mild, and a simple qualitative restriction is often sufficient to control the glycosuria.

The diet allowance for children with diabetes should be more liberal than for adults, and, except in most severe cases, more liberal amounts of carbohydrate and protein are allowed. A growing child should have a proportionately higher number of calories per Kg. of body weight. He requires at least 100 Gm. of carbohydrate and a protein allowance of not less than from 2 to 3 Gm. per Kg. of body weight starting at about four years of age, the protein being gradually decreased to 1 or 1.5 Gm. per Kg. as the child approaches adult life. One should, of course, emphasize the necessity of incorporating at least a pint of milk in the diet of the growing child.

DIRECTIONS FOR APPLICATION OF DIETS

In cases of very mild diabetes, the glycosuria may be controlled by simple qualitative restrictions. The diet of the diabetic patient who is not controlled by simple qualitative restriction has to be carefully weighed or measured out in household measures. It is necessary to determine how many grams of carbohydrate, protein and fat he may have daily. The success in the management of the diabetic patient is directly proportional to the degree of education he receives. To make this easier many special handbooks containing food tables, etc., have been prepared for him.

With the above factors in mind we will present seven series of diets. Series 1 contains 100 Gm. carbohydrate, 60 Gm. protein and calories ranging from 1,400 to 2,600. Series 2 contains 125 Gm. carbohydrate, 70 Gm. protein and calories ranging from 1,600 to 2,800. Series 3 contains 150 Gm. carbohydrate, 70 Gm. protein and calories ranging from 1600 to 2800. Series 4, 175 Gm. carbohydrate. Series 5, 200 Gm. carbohydrate. Series 6, 225 Gm. carbohydrate, and Series 7, 250 Gm. carbohydrate.

The first and second series, containing 100 and 125 Gm. carbohydrate, respectively, may be used for the occasional patient, with a severe or moderately severe type of diabetes, who would rather live on a restricted carbohydrate intake that will keep him sugar-free without insulin than a more liberal diet with insulin.

Series 3, 4 and 5 containing 150, 175 and 200 Gm. carbohydrate, respectively, may be used for the patient with a moderately severe diabetes who desires a more liberal carbohydrate intake and who, if insulin is required to maintain sugar-free urine, is able and willing to use insulin.

Series 6 and 7 are presented for the use of the physician who prefers giving a higher intake of carbohydrate. Also, some patients may be able to tolerate a higher carbohydrate intake, while others will not follow or adjust themselves to a lower carbohydrate intake.

If, in order to maintain weight slightly below normal, the individual case requires a number of calories not in these series of diets, one can choose the caloric value outlined that is closest to the individual needs and increase or decrease the calories by simply adding or subtracting a definite amount of the fat. For example, 10 Gm. of butter, or one square, give approximately 75 calories.

If, for any reason, a higher or lower protein intake is indicated, protein food such as meat, eggs and cheese may be added or subtracted. For example, one egg furnishes 6 Gm. protein and 6 Gm. fat. Twenty Gm., or a one-inch cube, of solid cheese furnish 6 Gm. protein and 7 Gm. fat. Forty-five Gm. meat, or 1½ oz., furnish 11 Gm. protein and 7 Gm. fat.

Suggested substitutions permissible in all these diabetic diets are outlined following the seven series on pp. 148 and 149.

The approximate average mineral content of all diets in the five series is:

Calcium	.921	Gm.
Phosphorus	1.053	"
Iron	.0124	"

SIMPLE QUALITATIVE RESTRICTION

Typical Foods Allowed

1. Vegetables, 3 per cent and 6 per cent
2. Fruits
3. Meat
4. Eggs
5. Milk in limited amounts
6. Cream
7. Cheese
8. Fats
    - Butter
    - Salad dressing with oil*
9. Bread in limited amounts
0. Bread substitutes, such as:
    - Bran soy muffins†
    - Soybean wafers‡
1. Nuts
2. Saccharin
3. Clear meat broths as desired

Typical Foods to Avoid

1. Sugar in any form, such as:
    - Candy
    - Chewing gum
    - Molasses
    - Sirup
    - Honey
    - Jelly and jam
    - Preserved fruit
2. Foods that have sugar added:
    - Fruits canned with sugar
    - Vegetables canned with sugar
3. Dried fruits
4. Starches, such as:
    - Macaroni
    - Spaghetti
    - Noodles
    - Crackers
    - Pastry, pie, cake
5. Vegetables high in carbohydrate, such as:
    - Potatoes
    - Shelled beans
    - Corn—hominy
6. Alcohol
7. Any foods whose composition is not known or whose composition is questionable

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* Recipes, p. 717.
† Recipes, p. 718.
‡ Recipes, p. 718.

Series 1

100 Gm. Carbohydrate
1,400 Calories

Quantitative and Estimated Quantitative
Total Food Allowance for One Day

Carbohydrate 100, Protein 61, Fat 86, Calories 1,418, Sugar Value 144

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	60	3 thin slices
Muffin (bran soy)		
Butter	30	3 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	75	1 serving (2½ oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Series 1

100 Gm. Carbohydrate
1,400 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	3 slices	15
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Egg or egg substitute	1	50
Vegetable, 3%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 thin slice	20
Butter	1 square	10
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	75
Vegetable, 6%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 thin slice	20
Butter	1 square	10
Fruit, 10%	1 serving	100
Milk	1 glass	200

Series 1

100 Gm. Carbohydrate
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 100, Protein 61, Fat 128, Calories 1,796, Sugar Value 148

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	60	3 thin slices
Muffin (bran soy)		
Butter	50	5 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	75	1 serving (2½ oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Series 1

100 Gm. Carbohydrate
1,800 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	3 slices	15
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Egg or egg substitute	1	50
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	2 squares	20
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	2 squares	20
Fruit, 10%	1 serving	100
Milk	1 glass	200

Series 1

100 Gm. Carbohydrate
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 100, Protein 61, Fat 175, Calories 2,219, Sugar Value 153

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	60	3 thin slices
Muffin, bran soy		
Butter	105	10½ squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	75	1 serving (2½ oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Series 1

100 Gm. Carbohydrate
2,200 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	3 slices	15
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	2 squares	20
Cream	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Egg or egg substitute	1	50
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	4 squares	40
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	4½ squares	45
Fruit, 10%	1 serving	100
Milk	1 glass	200

Series 1

100 Gm. Carbohydrate
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 100, Protein 61, Fat 217, Calories 2,597, Sugar Value 157

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	60	3 thin slices
Muffin (bran soy)		
Butter	125	12½ squares
Salad dressing with oil	60	4 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	75	1 serving (2½ oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Series 1

100 Gm. Carbohydrate
2,600 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	3 slices	15
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	2 squares	20
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Egg or egg substitute	1	50
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 thin slice	20
Butter	5 squares	50
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	75
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 thin slice	20
Butter	5½ squares	55
Fruit, 10%	1 serving	100
Milk	1 glass	200

Series 2

125 Gm. Carbohydrate
1,600 Calories

Quantitative and Estimated Quantitative Total Food Allowance for One Day

Carbohydrate 127, Protein 70, Fat 92, Calories 1,616, Sugar Value 177

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	60	3 thin slices
Butter	35	3½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	15	3 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cup
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Potato or substitute*	75	1 small serving

* Corn, rice, macaroni, spaghetti or 20 per cent fruit may be substituted for potato

Series 2

125 Gm. Carbohydrate
1,600 Calories

Suggested Distribution of the Total Food Allowance for One Day

Food	Amount	Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	3 slices	15
Egg	1	50
Bread	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 thin slice	20
Butter	1 square	10
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 thin slice	20
Butter	1½ squares	15
Fruit, 10%	1 serving	100
Milk	1 glass	200

Series 2

125 Gm. Carbohydrate
2,000 Calories

Quantitative and Estimated Quantitative
Total Food Allowance for One Day

Carbohydrate 127, Protein 70, Fat 134, Calories 1,994, Sugar Value 181

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	60	3 thin slices
Butter	55	5½ squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	15	3 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Potato or substitute	75	1 small serving

Series 2

125 Gm. Carbohydrate
2,000 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	3 slices	15
Egg	1	50
Bread	1 thin slice	20
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	2 squares	20
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	2 squares	20
Fruit, 10%	1 serving	100
Milk	1 glass	200

Series 2

125 Gm. Carbohydrate
2,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 127, Protein 70, Fat 181, Calories 2,417, Sugar Value 186

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	60	3 thin slices
Butter	80	8 squares
Salad dressing with oil	60	4 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	15	3 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Potato or substitute	75	1 small serving

Series 2

125 Gm. Carbohydrate
2,400 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal	½ cup	105
Bacon	3 slices	15
Egg	1	50
Bread	1 thin slice	20
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 thin slice	20
Butter	3 squares	30
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 thin slice	20
Butter	3½ squares	35
Fruit, 10%	1 serving	100
Milk	1 glass	200

Series 2

125 Gm. Carbohydrate
2,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 127, Protein 70, Fat 222, Calories 2,786, Sugar Value 191

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	60	3 thin slices
Butter	110	11 squares
Salad dressing with oil	60	4 tablespoons
Milk	300	1½ glasses
Cream, 20%	150	¾ glass
Meat (lean)	120	2 servings (4 oz.)
Bacon	20	3-4 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Potato or substitute	75	1 small serving

Series 2

125 Gm. Carbohydrate
2,800 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	3–4 slices	20
Egg	1	50
Bread	1 thin slice	20
Butter	2 squares	20
Cream, 20%	¼ glass	50
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 thin slice	20
Butter	4½ squares	45
Fruit, 10%	1 serving	100
Milk	¾ glass	150
Cream, 20%	¼ glass	50
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 thin slice	20
Butter	4½ squares	45
Fruit, 10%	1 serving	100
Milk	¾ glass	150
Cream, 20%	¼ glass	50

Series 3

150 Gm. Carbohydrate
1,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 148, Protein 71, Fat 81, Calories 1,605, Sugar Value 197

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	90	3 slices
Butter	25	2½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Potato or substitute	75	1 small serving

Series 3

150 Gm. Carbohydrate
1,600 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	1 slice	30
Butter	½ square	5
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 slice	30
Butter	1 square	10
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Salad: vegetable, 3%	1 serving	100
Vegetable, 6%	1 serving	100
Bread	1 slice	30
Butter	1 square	10
Fruit, 15%	1 serving	100
Milk	1 glass	200

Series 3

150 Gm. Carbohydrate
2,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 148, Protein 71, Fat 125, Calories 2,001, Sugar Value 202

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	15	1 tablespoon
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving
Fruit, 5%		
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Potato or substitute	75	1 small serving

Series 3

150 Gm. Carbohydrate
2,000 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit, 15%	1 serving	100
Milk	1 glass	200

Series 3

150 Gm. Carbohydrate
2,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 148, Protein 71, Fat 170, Calories 2,406, Sugar Value 206

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	90	3 slices
Butter	85	8½ squares
Salad dressing with oil	45	3 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Potato or substitute	75	1 small serving

Series 3

150 Gm. Carbohydrate
2,400 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
	BREAKFAST	
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
	LUNCHEON	
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	3 squares	30
Fruit, 10%	1 serving	100
Milk	1 glass	200
	DINNER	
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 slice	30
Butter	3½ squares	35
Fruit, 15%	1 serving	100
Milk	1 glass	200

Series 3

150 Gm. Carbohydrate
2,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 149, Protein 71, Fat 212, Calories 2,788, Sugar Value 211

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	90	3 slices
Butter	95	9½ squares
Salad dressing with oil	60	4 tablespoons
Milk	300	1½ glasses
Cream, 20%	180	¾ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Potato or substitute	75	1 small serving

Series 3

150 Gm. Carbohydrate
2,800 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 slice	30
Butter	3½ squares	35
Milk	¾ glass	150
Cream, 20%	¼ cup	60
Fruit, 10%	1 serving	100
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 slice	30
Butter	4 squares	40
Milk	¾ glass	150
Cream, 20%	¼ cup	60
Fruit, 15%	1 serving	100

Series 4

175 Gm. Carbohydrate
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 178, Protein 73, Fat 89, Calories 1,805, Sugar Value 229

Food	*Gram Weight*	*Household Measure*
Cereal (dry)	105	½ cup
Bread	90	3 slices
Butter	35	3½ squares
Mayonnaise		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 10%	100	1 serving
Fruit, 15%	200	2 servings
Potato or substitute	200	2 servings

Series 4

175 Gm. Carbohydrate
1,800 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 3%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 slice	30
Butter	1 square	10
Fruit, 15%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Salad: vegetable, 3%	1 serving	100
Vegetable, 6%	1 serving	100
Bread	1 slice	30
Butter	1½ squares	15
Fruit, 15%	1 serving	100
Milk	1 glass	200

Series 4

175 Gm. Carbohydrate
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 178, Protein 73, Fat 135, Calories 2,219, Sugar Value 233

Food	*Gram Weight*	*Household Measure*
Cereal (dry)	105	½ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings
Vegetables, 6%	100	1 serving
Fruit, 10%	100	1 serving
Fruit, 15%	200	2 servings
Potato or substitute	200	2 servings

Series 4

175 Gm. Carbohydrate
2,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

BREAKFAST		*Gm.*
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	1 slice	30
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit, 15%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2½ squares	25
Fruit, 15%	1 serving	100
Milk	1 glass	200

Series 4

175 Gm. Carbohydrate
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 174, Protein 73, Fat 181, Calories 2,605, Sugar Value 238

Food	*Gram Weight*	*Household Measure*
Cereal (dry)	105	½ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	60	4 tablespoons
Milk	300	1½ glasses
Cream, 20%	180	¾ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings
Vegetables, 6%	100	1 serving
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 servings
Potato or substitute	200	2 servings

Series 4

175 Gm. Carbohydrate
2,600 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	1 slice	30
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 slice	30
Butter	2 squares	20
Milk	¾ glass	150
Cream, 20%	¼ cup	60
Fruit, 10%	1 serving	100
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 slice	30
Butter	2½ squares	25
Milk	¾ glass	150
Cream, 20%	¼ cup	60
Fruit, 15%	1 serving	100

Series 5

200 Gm. Carbohydrate
2,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 200, Protein 80, Fat 94, Calories 1,968

Food	*Gram Weight*	*Household Measure*
Cereal (dry)	105	½ cup
Bread	90	3 slices
Butter	30	3 squares
Milk (skimmed)	800	4 glasses
Cream, 20%	60	4 tablespoons
Meat (lean)	120	2 servings (4 oz.)
Egg	50	1
Vegetables, 3%	300	3 servings
Vegetables, 6%	100	1 serving
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Potato or substitute	200	2 servings
Soda crackers	20	3 crackers (3″ x 3″)

Series 5

200 Gm. Carbohydrate
2,000 Calories

Suggested Distribution of the Total Food Allowance for One Day

BREAKFAST		
		Gm.
Fruit, 10%	1 serving	100
Cereal (dry)	½ cup	105
Egg	1	50
Bread	1 slice	30
Butter	1 square	10
Cream, 20%	4 tablespoons	60
Milk (skimmed)	1 glass	200
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 3%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 slice	30
Butter	1 square	10
Milk (skimmed)	1 glass	200
Fruit, 10%	1 serving	100
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 6%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 slice	30
Butter	1 square	10
Milk (skimmed)	1 glass	200
Fruit, 15%	1 serving	100
Bedtime feeding:		
Milk (skimmed)	1 glass	200
Soda crackers	3 crackers	20

Series 5

200 Gm. Carbohydrate
2,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 202, Protein 81, Fat 139, Calories 2,384

Food	*Gram Weight*	*Household Measure*
Cereal (dry)	105	½ cup
Bread	120	4 slices
Butter	20	2 squares
Salad dressing with oil	60	4 tablespoons
Milk	500	2½ glasses
Cream, 20%	90	6 tablespoons
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	100	1 serving
Vegetables, 6%	300	3 servings
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Potato or substitute	200	2 servings

Series 5

200 Gm. Carbohydrate
2,400 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
	BREAKFAST	
Fruit, 10%	1 serving	100
Cereal (dry)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	1 slice	30
Butter	½ square	5
Cream, 20%	2 tablespoons	30
Beverage—coffee or tea		
	LUNCHEON	
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 6%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1½ slices	45
Butter	½ square	5
Milk	¾ glass	150
Cream, 20%	2 tablespoons	30
Fruit, 10%	1 serving	100
	DINNER	
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1½ slices	45
Butter	1 square	10
Milk	¾ glass	150
Cream, 20%	2 tablespoons	30
Fruit, 15%	1 serving	100
Bedtime feeding:		
Milk	1 glass	200

Series 6

225 Gm. Carbohydrate
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 224, Protein 82, Fat 110, Calories 2,211

Food	*Gram Weight*	*Household Measure*
Cereal (dry)	105	½ cup
Bread	180	6 slices
Butter	35	3½ squares
Milk	300	1½ glasses
Cream, 20%	60	4 tablespoons
Meat (lean)	120	2 servings (4 oz.)
Egg	50	1
Vegetables, 3%	300	3 servings
Vegetables, 6%	100	1 serving
Vegetables, 20%	100	1 serving
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Potato or substitute	200	2 servings

Series 6

225 Gm. Carbohydrate
2,200 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (dry)	½ cup	105
Egg	1	50
Bread	2 slices	60
Butter	1½ squares	15
Cream, 20%	4 tablespoons	60
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 3%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	2 slices	60
Butter	1 square	10
Milk	¾ glass	150
Fruit, 10%	1 serving	100
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 20%	1 serving	100
Vegetable, 6%	1 serving	100
Bread	2 slices	60
Butter	1 square	10
Milk	¾ glass	150
Fruit, 15%	1 serving	100

Series 6

225 Gm. Carbohydrate
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 226, Protein 83, Fat 150, Calories 2,562

Food	*Gram Weight*	*Household Measure*
Cereal (dry)	105	½ cup
Bread	165	5½ slices
Butter	40	4 squares
Salad dressing with oil	60	4 tablespoons
Milk	300	1½ glasses
Cream, 20%	90	6 tablespoons
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings
Vegetables, 6%	100	1 serving
Vegetables, 20%	100	1 serving
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Potato or substitute	200	2 servings

Series 6

225 Gm. Carbohydrate
2,600 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

BREAKFAST		
		Gm.
Fruit, 10%	1 serving	100
Cereal (dry)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	2 slices	60
Butter	1½ squares	15
Cream, 20%	2 tablespoons	30
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1½ slices	45
Butter	1 square	10
Milk	¾ glass	150
Cream, 20%	2 tablespoons	30
Fruit, 10%	1 serving	100
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 20%	1 serving	100
Vegetable, 6%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	2 slices	60
Butter	1½ squares	15
Milk	¾ glass	150
Cream, 20%	2 tablespoons	30
Fruit, 15%	1 serving	100

Series 7

250 Gm. Carbohydrate
2,200 Calories

Quantitative and Estimated Quantitative Total Food Allowance for One Day

Carbohydrate 250, Protein 86, Fat 95, Calories 2,188

Food	*Gram Weight*	*Household Measure*
Cereal (dry)	105	½ cup
Bread	180	6 slices
Butter	30	3 squares
Milk (skimmed)	400	2 glasses
Cream, 20%	60	4 tablespoons
Meat (lean)	120	2 servings (4 oz.)
Egg	50	1
Vegetables, 3%	300	3 servings
Vegetables, 20%	100	1 serving
Vegetables, 6%	100	1 serving
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Fruit, 20%	100	1 serving
Potato or substitute	200	2 servings

Series 7

250 Gm. Carbohydrate
2,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

	BREAKFAST	
		Gm.
Fruit, 10%	1 serving	100
Cereal (dry)	½ cup	105
Egg	1	50
Bread	2 slices	60
Butter	1 square	10
Cream, 20%	4 tablespoons	60
Milk (skimmed)	1 glass	200
Beverage—coffee or tea		
	LUNCHEON	
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 3%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	2 slices	60
Butter	1 square	10
Fruit, 20%	1 serving	100
	DINNER	
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 20%	1 serving	100
Vegetable, 6%	1 serving	100
Bread	2 slices	60
Butter	1 square	10
Milk (skimmed)	1 glass	200
Fruit, 10%	1 serving	100
Bedtime feeding:		
Fruit, 15%	1 serving	100

Series 7

250 Gm. Carbohydrate
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 257, Protein 85, Fat 142, Calories 2,588

Food	*Gram Weight*	*Household Measure*
Cereal (dry)	105	½ cup
Bread	180	6 slices
Butter	30	3 squares
Salad dressing with oil	60	4 tablespoons
Milk	300	1½ glasses
Cream, 20%	90	6 tablespoons
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings
Vegetables, 6%	100	1 serving
Vegetables, 20%	100	1 serving
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving
Fruit, 20%	100	1 serving
Potato or substitute	200	2 servings

Series 7

250 Gm. Carbohydrate
2,600 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (dry)	½ cup	105
Bacon	2 slices	10
Egg	1	50
Bread	2 slices	60
Butter	1 square	10
Cream, 20%	2 tablespoons	30
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	2 slices	60
Butter	1 square	10
Milk	¾ glass	150
Cream, 20%	2 tablespoons	30
Fruit, 20%	1 serving	100
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Salad:		
Vegetable, 20%	1 serving	100
Vegetable, 6%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	2 slices	60
Butter	1 square	10
Milk	¾ glass	150
Cream, 20%	2 tablespoons	30
Fruit, 10%	1 serving	100
Bedtime feeding:		
Fruit, 15%	1 serving	100

A Few Suggested Substitutions

The following substitutions have been planned so that the carbohydrate, the protein, the fat, the calories, the minerals and the vitamin content are not appreciably changed. It is important to note that all these food substitutions are not to be interchanged. For example, fruit or vegetable may be substituted for the bread in the diet, but bread is not to be substituted for the fruit or the vegetable.

1. In place of 20 Gm. bread, one of the following may be had:

Vegetables, 3%	375	Gm.
Vegetables, 6%	175	"
Vegetables, 15%	75	"
Fruit, 5%	225	"
Fruit, 10%	100	"
Cereal (cooked)	100	"
Cereal (dry)	14	"
Potato	50	"
Corn, green	50	"

2. In place of one bran soy muffin, one of the following groups may be had:

1.	Soybean wafers*	2	
	Butter	5	Gm.
2.	Cream, 40%	25	"
	Jello without sugar†	1	
3.	Bacon	10	Gm.
	Cream, 20%	25	"
4.	Meat	10	"
	Cream, 20%	25	"
5.	Cottage cheese	30	"
	Butter	20	"

* Soybean wafer, p. 718.

† Jello without sugar, p. 717.

3. In place of two bran soy muffins, one of the following groups may be had:

1.	Soybean wafers	3	
	Butter	15	Gm.
	Vegetables, 3%	50	"
2.	Vegetables, 3%	50	"
	Egg	1	
	Butter	15	Gm.
3.	Bacon	15	"
	Cream, 20%	50	"
4.	Meat	15	Gm.
	Cream, 20%	50	"
	Butter	5	"

4. In place of 60 Gm. 20 per cent cream and 30 Gm. butter, one may have:

Cream, 40%	100	Gm.

5. In place of 30 Gm. 20 per cent cream, one may have:

Nuts	10	Gm.

Any of the nuts except chestnuts listed in the composition of foods on p. 708.

6. In place of 10 Gm. butter, one may have 10 Gm. salad dressing with oil.

7. In place of one egg, one may have one of the following groups:

1.	Meat	25	Gm.
2.	Liver	30	"
	Butter	5	"
3.	Fish other than salmon	30	"
	Butter	5	"
4.	Salmon	30	"
5.	Shrimp	25	"
	Butter	5	"
6.	Crabmeat	40	"
	Butter	5	"
7.	Lobster	35	"
	Butter	5	"
8.	Sardines	30	"
9.	Dried Beef	20	"
	Butter	5	"
10.	Cheese, solid	20	"

8. In place of 100 Gm. 6 per cent vegetable, one may have one of the following:

Vegetables, 3%	200	Gm.
Fruit, 5%	120	"

9. In place of 100 Gm. 10 per cent fruit, one may have one of the following:

Fruit, 5%	200	Gm.
Vegetables, 3%	300	"
Vegetables, 6%	175	"
Fruit, 15%	65	"

10. In place of 75 Gm. potato, one may have one of the following:

Fruit, 10%	150	Gm.
Fruit, 15%	100	"
Bread	20	"
Corn	75	"
Rice (cooked)	75	"
Macaroni or spaghetti (cooked)	75	"

PROCEDURE IN CASES COMPLICATED BY INFECTIONS, INTERCURRENT DISEASES AND SURGICAL OPERATIONS

Infections. It is common knowledge that the severity of diabetes may be at least temporarily increased by infections of all kinds, even by minor maladies such as acute rhinitis, tonsillitis and furunculosis. The more severe the infectious process, the more dangerous it becomes in these cases. Heretofore conditions like pneumonia have presented almost unsurmountable obstacles. The manipulation of the diet and the insulin dosage in such cases may be extremely difficult and they always demand the constant watchfulness of the medical attendants. The danger lies partly in the rapid fluctuation produced in the patient's tolerance by variations in the degree of intoxication and partly in the fitfulness of the patient's appetite and the consequent difficulty of controlling the intake of food. A similarly complex situation is presented in the postoperative condition of patients requiring surgery. Insulin should materially reduce the danger from anesthetics and surgical shock, but only if it is used wisely. In caring for patients with such complications it is our usual practice to limit the diet to liquid foods, such as milk, cream, fruit juices, custard and eggnogs, weighing the amounts of these eaten and calculating the intake of sugar with the customary precision. The carbohydrate content of these diets may be somewhat higher than would otherwise be desirable. Insulin is given in amounts to protect the patient adequately from acidosis, but no special effort is made to control glycosuria until the emergency has passed and the rate of acetone production has subsided. When the critical period is safely over, the daily quota of insulin may be reduced and the patient returned to the previous routine. During the periods complicated by severe infections, and in some postoperative cases, the amount of insulin necessary to control acidosis may be as much as 60, 80 or 100 units a day. It seems that these patients are unusually resistant to the action of insulin. Obviously, it is undesirable to give such large amounts in one injection, and in such circumstances multiple smaller injections are given every six hours. The dose is gauged by the result of examination of each specimen of urine as it is passed, insulin being administered whenever the specimen shows a postive aceto-acetic acid reaction.

It is important to make certain that urine is not being retained, and, especially in postoperative cases, it may be necessary to catheterize the bladder at regular intervals. It is also of the greatest assistance to examine the blood frequently for its plasma carbon dioxide combining power. Close attention to the clinical condition of the patient is of the utmost importance, and during such crises the physician and the nurse must be constantly on the watch for either the appearance of dysuria or of acetone bodies in the urine, or for overaction of insulin. On the one hand, and always hovering close, is the specter of death from acidosis and, on the other hand, the danger of hypoglycemia. To pass safely between the two requires judgment and courage. Timidity in the administration of insulin will end the voyage as surely as will reckless and uncontrolled treatment.

Surgery. It is always wise, when possible, to prepare a patient for operation by a preliminary period of medical treatment in order to have him in a normal acid-base equilibrium at the time of surgical interference. It also seems wise to make sure that the liver is fairly well stored with glycogen. To accomplish this the carbohydrate allowance of the diet may be increased for a day or two before operation, adequate provision being made for its assimilation by increasing the dose of insulin proportionately. On the morning of the operation food is withheld; nevertheless, an injection of from 20 to 30 units of insulin is made one half hour before the time scheduled for the operation. The hyperglycemia provoked by the shock of operation or by the anesthetic will serve as a buffer for this injection.

Four diets are presented on pages 152 to 159 for use in cases of diabetes mellitus complicated by infections, intercurrent disease or surgery (except sugery for peptic ulcer) . These diets represent four distinct steps, proceeding from Diet 1, which is a liquid diet, to Diet 2, a semi-solid, to Diet 3, a bland diet, and finally to Diet 4, which approaches the diet the patient was able to take before the infections, intercurrent disease or surgery.

COMPLICATED BY INFECTIONS, INTERCURRENT DISEASES OR SURGERY (EXCEPT PEPTIC ULCER)

Diet 1 (Liquid)

120 Gm. Carbohydrate
542 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 120, Protein 1, Fat 6, Calories 542, Sugar Value 121

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin, soybean		
Butter		
Salad dressing with oil		
Milk		
Cream, 20%	30	2 tablespoons
Cream, 40%		
Meat (lean)		
Bacon		
Egg		
Vegetables, 3%		
Vegetables, 6%		
Fruit, 5%		
Fruit, 10% juice	1,200	6 glasses
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

COMPLICATED BY INFECTIONS, INTERCURRENT DISEASES OR SURGERY (EXCEPT PEPTIC ULCER)

Diet 1 (Liquid)

120 Gm. Carbohydrate
542 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

			Gm.
8 A.M.	Fruit juice, 10%	1 glass	200
	Cream, 20%	2 tablespoons	30
	Beverage—coffee or tea		
10 A.M.	Fruit juice, 10%	1 glass	200
12 M.	Clear broth*		
	Fruit juice, 10%	1 glass	200
4 P.M.	Fruit juice, 10%	1 glass	200
6 P.M.	Fruit juice, 10%	1 glass	200
8 P.M.	Fruit juice, 10%	1 glass	200

* Clear broth, coffee and tea have no food value, therefore may be used as often as desired.

COMPLICATED BY INFECTIONS, INTERCURRENT DISEASES OR SURGERY (EXCEPT PEPTIC ULCER)

Diet 2 (Semisolid)

---

94 Gm. Carbohydrate
1,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 94, Protein 27, Fat 80, Calories 1,204, Sugar Value 118

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	70	⅓ cup
Bread	30	1½ thin slices
Muffin (bran soy)		
Butter	40	4 squares
Salad dressing with oil		
Milk	200	1 glass
Cream, 20%	120	½ cup
Cream, 40%		
Meat (lean)		
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% } puréed	60	¼ cup for cream soup
Fruit, 5%		
Fruit, 10% juice	400	2 glasses
Vegetables and fruit, 15%		
Potato or substitute	50	1 small serving

COMPLICATED BY INFECTIONS, INTERCURRENT DISEASES OR SURGERY (EXCEPT PEPTIC ULCER)

Diet 2 (Semisolid)

---

94 Gm. Carbohydrate
1,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10% juice	½ glass	100
Cereal (cooked)	⅓ cup	70
Egg	1	50
Bread (toast)	½ thin slice	10
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Cream soup:		
Cream, 20%	¼ cup	60
Vegetable purée, 6%	¼ cup	60
Bread (toast)	½ thin slice	10
Butter	2 squares	20
Milk	½ glass	100
Fruit, 10% juice	½ glass	100
3 P.M. Fruit, 10% juice	½ glass	100
DINNER		
Clear broth*		
Egg	1	50
Potato, baked or mashed	1 small serving or ¼ cup	50
Bread (toast)	½ thin slice	10
Butter	1 square	10
Milk	½ glass	100
Fruit, 10% juice	½ glass	100

* Consommé or clear meat broth may be taken as desired without adding any food value to diet.

COMPLICATED BY INFECTIONS, INTERCURRENT DISEASES OR SURGERY (EXCEPT PEPTIC ULCER)

Diet 3 (Bland)

85 Gm. Carbohydrate
1,450 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 86, Protein 41, Fat 104, Calories 1,444, Sugar Value 120

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	70	⅓ cup
Bread	30	1½ thin slices
Muffin (bran soy)		
Butter	50	5 squares
Salad dressing with oil		
Milk	300	1½ glasses
Cream, 20%	150	¾ glass
Cream, 40%		
Meat (lean) *	45	1 small serving (1½ oz).
Bacon	10	2 slices crisp
Egg	50	1
Vegetables, 3% Vegetables, 6% } puréed	200	2 servings (1 cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

* Chicken, fish or scraped beef.

COMPLICATED BY INFECTIONS, INTERCURRENT DISEASES OR SURGERY (EXCEPT PEPTIC ULCER)

Diet 3 (Bland)

85 Gm. Carbohydrate
1,450 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
	BREAKFAST	
Fruit, 10%	1 serving	100
Cereal (cooked)	⅓ cup	70
Bacon	2 slices, crisp	10
Bread (toast)	½ thin slice	10
Butter	1 square	10
Cream, 20%	¼ glass	50
Beverage—coffee or tea		
	LUNCHEON	
Egg or egg substitute	1	50
Vegetable purée, 3%	1 serving	100
Bread	½ thin slice	10
Butter	2 squares	20
Milk	¾ glass	150
Cream, 20%	¼ glass	50
Fruit, 10%	1 serving	100
	DINNER	
Meat*	1 serving	45
Vegetable purée, 6%	1 serving	100
Bread	½ thin slice	10
Butter	2 squares	20
Milk	¾ glass	150
Cream, 20%	¼ glass	50
Fruit, 10%	1 serving	100

* Chicken, fish or scraped beef.

COMPLICATED BY INFECTIONS, INTERCURRENT DISEASES OR SURGERY (EXCEPT PEPTIC ULCER)

Diet 4 (Full Diet)

75 Gm. Carbohydrate
1,650 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 76, Protein 54, Fat 126, Calories 1,654, Sugar Value 120

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	70	⅓ cup
Bread	20	1 thin slice
Muffin (bran soy)	50	2
Butter	50	5 squares
Salad dressing with oil	15	1 tablespoon
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	45	1 serving (1½ oz.)
Bacon	10	2 slices crisp
Egg	100	2
Vegetables, 3%	200	2 servings
Vegetables, 6%	100	1 serving
Fruit, 5%	200	2 servings
Fruit, 10%	100	1 serving
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

COMPLICATED BY INFECTIONS, INTERCURRENT DISEASES OR SURGERY (EXCEPT PEPTIC ULCER)

Diet 4 (Full Diet)

75 Gm. Carbohydrate
1,650 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅓ cup	70
Bacon	2 slices, crisp	10
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee or tea		
LUNCHEON		
Egg or egg substitute	1	50
Vegetable, 3%	1 serving	100
Bran soy muffin	1	25
Butter	2 squares	20
Fruit, 5%	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 small serving	45
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bran soy muffin	1	25
Butter	2 squares	20
Fruit, 5%	1 serving	100
Milk	1 glass	200

POSTOPERATIVE DIETARY REGIMEN FOR ULCER OF THE STOMACH OR THE DUODENUM IN A DIABETIC PATIENT

The first day the patient is able to take anything by mouth, nothing should be given except weak tea, broth and water. If these liquids are tolerated well, the next day a small amount of food is given, the quantity being increased each day until the patient is able to handle a full bland diet with carbohydrate, protein, fat, calories and sugar value to meet his needs. A bland diet should be continued for several months following surgery, after which a gradual change to other foods may be made. This bland diet may be used for the diabetic patient with an ulcer who does not require surgical treatment.

First Day Food Is Given

Carbohydrate 20, Protein 6, Fat 7, Calories 167, Sugar Value 24

		Grams	*Household Measure*
8 A.M.	Cereal jelly*	45	2 rounding tablespoons
	Milk	30	2 tablespoons
12 M.	Rennet custard	60	¼ cup
4 P.M.	Cereal jelly	45	2 rounding tablespoons
	Milk	30	2 tablespoons
8 P.M.	Rennet custard	60	¼ cup

* Fine cereal, cooked and strained through a fine sieve.

Second Day

Carbohydrate 29, Protein 12, Fat 29, Calories 425, Sugar Value 39

		Grams	*Household Measure*
8 A.M.	Cereal jelly	45	2 rounding tablespoons
	Milk	30	2 tablespoons
10 A.M.	Milk	30	2 tablespoons
	Cream, 20%	30	2 tablespoons
12 M.	Rennet custard	60	¼ cup
2 P.M.	Milk	30	2 tablespoons
	Cream, 20%	30	2 tablespoons
4 P.M.	Rennet custard	60	¼ cup
6 P.M.	Cereal jelly	45	2 rounding tablespoons
	Milk	30	2 tablespoons
8 P.M.	Milk	30	2 tablespoons
	Cream, 20%	30	2 tablespoons

Third Day

Carbohydrate 31, Protein 19, Fat 47, Calories 623, Sugar Value 47

		Grams	*Household Measure*
8 A.M.	Cereal jelly	45	2 rounding tablespoons
	Milk	30	2 tablespoons
10 A.M.	Milk	45	3 tablespoons
	Cream, 20%	45	3 tablespoons
12 M.	Cream soup:		
	Milk	60	¼ cup
	Strained vegetable, 3 or 6%	30	2 tablespoons
2 P.M.	Milk	45	3 tablespoons
	Cream, 20%	45	3 tablespoons
4 P.M.	Jello without sugar	100	½ cup, scant
	Cream, 20%	30	2 tablespoons
6 P.M.	Custard without sugar*	90	½ cup, scant
8 P.M.	Milk	45	3 tablespoons
	Cream, 20%	45	3 tablespoons

* Recipe, p. 717.

Fourth Day

Carbohydrate 56, Protein 19, Fat 52, Calories 768, Sugar Value 72

		Grams	*Household Measure*
8 A.M.	Cereal jelly	70	⅓ cup
	Cream, 20%	30	2 tablespoons
	Orange juice	15	1 tablespoon
10 A.M.	Milk	45	3 tablespoons
	Cream, 20%	45	3 tablespoons
12 M.	Milk soup:		
	Milk	60	¼ cup
	Puréed vegetable, 3 or 6%	30	2 tablespoons
	Custard without sugar	90	½ cup, scant
2 P.M.	Milk	45	3 tablespoons
	Cream, 20%	45	3 tablespoons
4 P.M.	Puréed pear juice without sugar	100	½ glass
6 P.M.	Milk soup:		
	Milk	60	¼ cup
	Puréed vegetable, 3 or 6%	30	2 tablespoons
	Toast	15	½ slice
	Butter	5	½ square
8 P.M.	Milk	45	3 tablespoons
	Cream, 20%	45	3 tablespoons

Fifth Day

Carbohydrate 61, Protein 25, Fat 66, Calories 938, Sugar Value 82

		Grams	*Household Measure*
8 A.M.	Puréed pear	60	¼ cup
	Cereal jelly	70	⅓ cup
	Cream, 20%	30	2 tablespoons
	Milk	100	½ glass
	Orange juice	15	1 tablespoon
10 A.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
12 M.	Milk soup:		
	Milk	60	¼ cup
	Puréed vegetable, 3 or 6%	30	2 tablespoons
	Jello without sugar	100	½ cup, scant
	Cream, 20%	30	2 tablespoons
2 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
	Orange juice	15	1 tablespoon
4 P.M.	Custard without sugar	90	½ cup, scant
6 P.M.	Milk soup:		
	Milk	60	¼ cup
	Puréed vegetable, 3 or 6%	30	2 tablespoons
	Toast	15	½ slice
	Butter	5	½ square
	Orange juice	15	1 tablespoon
8 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass

Sixth Day

Carbohydrate 73, Protein 37, Fat 86, Calories 1,214, Sugar Value 103

		Grams	*Household Measure*
8 A.M.	Puréed peach	60	¼ cup
	Cereal jelly	70	⅓ cup
	Cream, 20%	30	2 tablespoons
	Milk	100	½ glass
	Orange juice	15	1 tablespoon
10 A.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
12 M.	Milk soup:		
	Milk	60	¼ cup
	Puréed vegetable, 3 or 6%	60	¼ cup
	Soft-cooked egg	50	1
	Jello without sugar	100	½ cup, scant
	Cream, 20%	30	2 tablespoons
	Orange juice	15	1 tablespoon
2 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
4 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
	Orange juice	15	1 tablespoon
6 P.M.	Milk toast:		
	Milk	120	½ cup
	Toast	20	1 slice, thin
	Butter	5	½ square
	Custard without sugar	90	½ cup, scant
	Orange juice	15	1 tablespoon
8 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass

Seventh Day

Carbohydrate 85, Protein 39, Fat 91, Calories 1,315, Sugar Value 117

		Grams	*Household Measure*
8 A.M.	Puréed pear or peach	60	¼ cup
	Finely cooked cereal	70	⅓ cup
	Cream, 20%	30	2 tablespoons
	Toast	10	½ thin slice
	Butter	5	½ square
	Milk	100	½ glass
	Orange juice	30	2 tablespoons
10 A.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
12 M.	Milk soup:		
	Milk	60	¼ cup
	Puréed vegetable, 3 or 6%	60	¼ cup
	Egg	50	1
	Toast	10	½ thin slice
	Butter	5	½ square
	Jello without sugar	100	½ cup, scant
2 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
4 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
6 P.M.	Milk toast:		
	Milk	120	½ cup
	Toast	20	1 thin slice
	Butter	5	½ square
	Custard without sugar	120	½ cup
	Orange juice	30	2 tablespoons
8 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass

Eighth Day

Carbohydrate 91, Protein 45, Fat 110, Calories 1,534, Sugar Value 128

		Grams	*Household Measure*
8 A.M.	Puréed peach	60	¼ cup
	Finely cooked cereal	70	⅓ cup
	Cream, 20%	30	2 tablespoons
	Egg	50	1
	Toast	15	½ slice
	Butter	5	½ square
	Milk	100	½ glass
	Orange juice	30	2 tablespoons
10 A.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
12 M.	Cream soup:		
	Cream, 20%	60	¼ cup
	Puréed vegetable, 3 or 6%	60	¼ cup
	Toast	15	½ slice
	Butter	5	½ square
	Custard without sugar	120	½ cup
	Milk	100	½ glass
	Orange juice	30	2 tablespoons
2 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
4 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
6 P.M.	Egg	50	1
	Toast	15	½ slice
	Butter	5	½ square
	Strained applesauce without sugar	60	¼ cup
	Milk	100	½ glass
8 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass

Ninth Day

Carbohydrate 95, Protein 45, Fat 123, Calories 1,667, Sugar Value 133

		Grams	*Household Measure*
8 A.M.	Puréed peach	60	¼ cup
	Finely cooked cereal	70	⅓ cup
	Cream, 20%	30	2 tablespoons
	Egg	50	1
	Toast	15	½ slice
	Butter	10	1 square
	Milk	100	½ glass
	Orange juice	30	2 tablespoons
10 A.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
12 M.	Cream soup:		
	{ Cream	60	¼ cup
	{ Puréed vegetable, 3 or 6%	60	¼ cup
	Puréed vegetable	60	¼ cup
	Toast	15	½ slice
	Butter	10	1 square
	Custard without sugar	120	½ cup
	Milk	100	½ glass
	Orange juice	30	2 tablespoons
2 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
4 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
6 P.M.	Egg	50	1
	Toast	15	½ slice
	Butter	10	1 square
	Strained applesauce without sugar	60	¼ cup
	Milk	100	½ glass
8 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass

Tenth Day

Carbohydrate 95, Protein 56, Fat 130, Calories 1,758, Sugar Value 140

		Grams	Household Measure
8 A.M.	Puréed pear	60	¼ cup
	Finely cooked cereal	70	⅓ cup
	Cream, 20%	30	2 tablespoons
	Egg	50	1
	Toast	15	½ slice
	Butter	10	1 square
	Milk	100	½ glass
	Orange juice	30	2 tablespoons
10 A.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
12 M.	Cream soup:		
	{ Cream	60	¼ cup
	{ Puréed vegetable, 3%	60	¼ cup
	Meat	45	1 small serving (1½ oz.)
	Toast	15	½ slice
	Butter	10	1 square
	Custard without sugar	120	½ cup
	Milk	100	½ glass
	Orange juice	30	2 tablespoons
2 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
4 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass
6 P.M.	Egg	50	1
	Puréed vegetable, 6%	60	¼ cup
	Toast	15	½ slice
	Butter	10	1 square
	Strained applesauce without sugar	60	¼ cup
	Milk	100	½ glass
8 P.M.	Milk	50	¼ glass
	Cream, 20%	50	¼ glass

COMPLICATED BY PEPTIC ULCER
Bland Diet

100 Gm. Carbohydrate
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 99, Protein 60, Fat 130, Calories 1,806, Sugar Value 147

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	70	⅓ cup
Bread	45	1½ slices
Butter	35	3½ squares
Milk	450	2¼ glasses
Cream, 20%	300	1½ glasses
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3%	200	2 servings (1 cup)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%, bland	180	3 small servings
Fruit, 10%, orange juice	90	½ glass scant
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Complicated by Peptic Ulcer

Bland Diet

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100 Gm. Carbohydrate
1,800 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
	BREAKFAST	
Fruit, 5%	1 small serving	60
Cereal (cooked)	⅓ cup	70
Egg	1	50
Bread (toast)	½ slice	15
Butter	1 square	10
Cream, 20%	¼ glass	50
Orange juice	2 tablespoons	30
Beverage—coffee substitute		
10 A.M. Milk	¼ glass	50
Cream, 20%	¼ glass	50
	LUNCHEON	
Egg or egg substitute	1	50
Vegetable, 3%	1 serving	100
Butter	1 square	10
Bread	½ slice	15
Milk	¾ glass	150
Cream, 20%	¼ glass	50
Fruit, 5%	1 small serving	60
Orange juice	2 tablespoons	30
3 P.M. Milk	¼ glass	50
Cream, 20%	¼ glass	50
	DINNER	
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Vegetable, 6%	1 serving	100
Bread	½ slice	15
Butter	1½ squares	15
Milk	¾ glass	150
Cream, 20%	¼ glass	50
Fruit, 5%	1 small serving	60
Orange juice	2 tablespoons	30
8 P.M. Milk	¼ glass	50
Cream, 20%	¼ glass	50

COMPLICATED BY PEPTIC ULCER
Bland Diet

100 Gm. Carbohydrate
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 99, Protein 60, Fat 172, Calories 2,184, Sugar Value 151

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	70	⅓ cup
Bread	45	1½ slices
Butter	85	8½ squares
Milk	450	2¼ glasses
Cream, 20%	300	1½ glasses
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3%	200	2 servings (1 cup)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%, bland	180	3 small servings
Fruit, 10%, orange juice	90	½ glass scant
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

COMPLICATED BY PEPTIC ULCER

Bland Diet

100 Gm. Carbohydrate
2,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 5%	1 small serving	60
Cereal (cooked)	⅓ cup	70
Egg	1	50
Bread (toast)	½ slice	15
Butter	2 squares	20
Cream, 20%	¼ glass	50
Orange juice	2 tablespoons	30
Beverage—coffee substitute		
10 A.M. Milk	¼ glass	50
Cream, 20%	¼ glass	50
LUNCHEON		
Egg or egg substitute	1	50
Vegetable, 3%	1 serving	100
Bread	½ slice	15
Butter	3 squares	30
Milk	¾ glass	150
Cream, 20%	¼ glass	50
Fruit, 5%	1 small serving	60
Orange juice	2 tablespoons	30
3 P.M. Milk	¼ glass	50
Cream, 20%	¼ glass	50
DINNER		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Vegetable, 6%	1 serving	100
Bread	½ slice	15
Butter	3½ squares	35
Milk	¾ glass	150
Cream, 20%	¼ glass	50
Fruit, 5%	1 small serving	60
Orange juice	2 tablespoons	30
8 P.M. Milk	¼ glass	50
Cream, 20%	¼ glass	50

TYPICAL FOODS USED IN PRESCRIBED AMOUNTS IN THE DIET OF A DIABETIC PATIENT WITH AN ULCER

Cereal:
- Oatmeal
- Cream of wheat
- Farina
- Breakfast Brownies
- Ralston
- Rice
- Cornflakes
- Puffed rice
- Puffed wheat
- Rice Krispies
- Rice flakes

Bread:
- White
- Graham

Egg:
- Soft-cooked
- Poached
- Baked omelet

Cheese:
- Cottage cheese
- Soft cream cheese

Meat:
- Chicken
- Fish
- Lamb
- Liver
- Scraped beef
- Sweetbreads
- Oysters
- Bacon

Vegetables:
- Carrots
- Squash
- Beets
- Peas
- Tender lettuce
- Spinach
- String beans
- Asparagus
- Cauliflower
- Strained tomatoes

Fruits—cooked without sugar
- Apple
- Prune
- Peach
- Pear
- Apricot
- White cherry
- Banana

Fruits—raw
- Ripe banana
- Ripe pear
- Orange juice

Desserts:
- Gelatin, such as:
  - Bavarian cream made from juices of fruit, without sugar, listed above
- Ice cream made without sugar

Beverages:
- Coffee substitutes, such as:
  - Kaffee Hag
  - Sanka coffee
- Milk

Condiments:
- Salt

Metabolic Diseases *(Continued)*

GOUT

Nature of the Condition

Disorder of purine metabolism

Object of Diet

The restriction of calories and a low purine intake

Gout is a disorder of metabolism associated with retention of uric acid and other purine bodies in the tissues and the blood. It is characterized clinically by attacks of acute arthritis, depositions of sodium urate in and about the joints, and by the occurrence of irregular constitutional symptoms.

IMPORTANT FACTORS IN DIETARY TREATMENT OF GOUT

1. Calories: Low
2. Purine: From free to low
3. Protein: Relatively low
4. Carbohydrate: High
5. Fat: Within caloric limits
6. Rich, highly seasoned foods: To be avoided
7. Coffee, tea, cocoa and alcohol: To be avoided

Calories: Low. The caloric value of the diet in gout should be low. Many patients suffering from gout are overweight: it is unusual to find gout in a thin individual. There seems to be a relationship between excessive food intake and gout. A high caloric intake, irrespective of the nature of the food, increases the uric-acid metabolism. It is important to keep the calories low enough to reduce obesity and to maintain the weight about 10 per cent below normal.

Purine: From Free to Low. As far as possible the diet should be low in purine or free of it. The foods which chiefly give rise to the uric-acid formation in the body are meats, fish and fowl, especially cellular organ meats, such as sweetbreads, liver and kidneys, and meat extract, but vegetables and other foods also contribute. As a matter of fact, it is almost impossible to outline a diet which is totally purine-free, for even the so-called purine free foods have small traces of nucleoprotein.

Protein: Relatively Low, but Adequate. The chief form in which protein should be given is milk, egg, cheese, shad roe and other purine-free foods. In the mild, chronic forms of gout, a little meat, fish or fowl may occasionally be allowed.

High carbohydrate is the natural result because of the type of foods permitted in the diet.

Fats within the caloric limits desired may be given chiefly in the form of butter and cream. Diets high in fat may provoke an attack.

Rich, highly seasoned foods should be avoided because of their irritating effect on the gastro-intestinal tract.

Coffee, Tea, Cocoa and Alcoholic Beverages Also Are to Be Avoided. Caffeine and its derivatives belong to the purine group, and although it is believed that caffeine is not convertible into uric acid, it is well to omit its use. Alcoholic beverages are definitely harmful. Beers and wines appear to be precipitating factors rather more frequently than distilled beverages.

Directions for Application of Diets

The dietary treatment of gout may be divided into three types of management. While cases of acute gout are not so commonly seen as formerly, chronic gout or gouty tendencies are probably much more common than realized and in many instances are mistaken for rheumatism (arthritis). However, when surgical operations are followed by acute articular symptoms, gouty arthritis may be assumed as the provisional diagnosis.

For acute gout, in which the diet should be purine-free and the caloric intake low, we suggest a diet with 1,400 or 1,800 calories and 60 Gm. protein. This diet is extremely simple and easily digested. Acute gout necessitates a greatly restricted diet, but ordinarily the duration of the acute stage is relatively short. The patient generally rests in bed. Calories and protein may be increased or decreased according to the individual needs as suggested on page 82. When the uric-acid retention of the blood is reduced to normal or approximately normal, the patient can be placed indefinitely upon a diet for chronic gout.

In chronic gout, or after the treatment for an acute gout, the following diets are suggested: Low purine diets allowing 1,400, 1,800 and 2,200 calories with 60 Gm. of protein without meat. In order to be effective and of benefit to the patient, these diets should be maintained for a long period of time, perhaps for years. This sounds as though it might be a great hardship, but it is surprising what a wide variety of foods almost free of uric-acid-forming substances are permissible. The chief deprivation, of course, is the meats and the moderation in amounts of food.

In the mild, chronic cases of gout, for variety's sake and provided the general principles just discussed for chronic gout are followed as a routine, a little meat, fish or fowl may be allowed occasionally. Diets of 60 Gm. protein and 1,400, 1,800 and 2,200 calories with a low purine content, yet allowing meat, are outlined. These diets can be used alternately with the low purine, meat-free group of diets which contain the same protein and calories.

Although water has not been shown to be of benefit in increasing uric-acid output, it has been advocated by many to be used in large amounts.

Further Treatment of Gout

Faithful adherence to a well-planned interval regimen, including dietetic control, will tend to diminish both the frequency and the severity of acute manifestations of the disease. The interval regimen recommended by Hench involves a low purine intake, avoidance of alcoholic beverages and the intermittent use of urate eliminants such as aspirin, sodium salicylates, neocinchophen and cinchophen.

Cinchophen (atophan) has been shown to be of valuable aid in the treatment of gout. McLester has reported experiments showing that cinchophen hastens the excretion of uric acid and thus reduces the amount of uric acid in the blood of gouty patients. Other writers claim that it not only hastens excretion of uric acid, but sets free stored uric acid, prevents further storage and inhibits purine metabolism.

Caution. In spite of the apparent value of cinchophen or neocinchophen in the treatment of gout, great caution should be observed in its use because of its toxic effects. Probably the most treacherous factor regarding its use in order to prevent toxic effects is the inability to ascertain any individual's tolerance for the drug.

In no case should the drug be continued over a long period of time, especially since some patients do not show toxic symptoms until after the drug has been discontinued.

One should always warn the patient to discontinue the drug immediately if he develops any early toxic symptoms such as gastro-intestinal disturbances, rashes or urticaria, itching of skin or jaundice.

With the above factors in mind it is probably best to prescribe the drug in small doses of about 0.5 Gm., well diluted in water, 4 to 6 times per day, for a short period of time.

The rationale for the dietetic program is based upon the facts that a diet low in purine diminishes the burden on the overtaxed purine-metabolizing mechanism; a diet high in fat seems to increase tubular resorption of urates, and a diet high in carbohydrates induces uric-acid diuresis, which can be increased by the supplementary use of cinchophen. Because of these considerations, patients should be placed upon a diet low in purines and in fats and high in carbohydrates and periodically given cinchophen, 7½ grains, 3 times a day for 3 days each week. Inasmuch as such a diet is low in both vitamins A and B, supplements of these vitamins should be added to the ration. Alcohol is not permitted.

TYPICAL FOODS ALLOWED IN THE TREATMENT OF GOUT

List 1

Foods which contain an insignificant amount of purine or no purine:

1. Beverages:
    Carbonated
    Chocolate ⎫ Use
    Cocoa ⎭ Moderately
    Coffee juice
    Postum
    Tea—Use moderately

*2. Butter

3. Bread and breadstuffs (except whole-grain under List 2) permitted:
    Benson's water crackers
    Butter Thins
    Corn bread
    Corn sticks
    French bread
    Gluten bread
    Holland rusk
    Rye bread
    Soda crackers
    Uneeda biscuit
    Water rolls
    White bread

4. Caviar

5. Cereals (except whole-grain under List 2) permitted:
    Breakfast brownies
    Cornflakes
    Cream of wheat
    Farina
    Grits
    Post Toasties
    Puffed rice
    Puffed wheat
    Rice flakes
    Rice Krispies
    White corn meal
    Yellow corn meal
   Miscellaneous cereal products:
    Arrowroot
    Hominy
    Macaroni
    Noodles
    Rice
    Sago
    Spaghetti
    Tapioca
    Vermicelli

*6. Cheese of all kinds:
    Cottage cheese
    Philadelphia cream cheese
    Small amounts of American cheese in combination

7. Eggs

*8. Fats of all kinds (but in moderation)

9. Fruits of all kinds

10. Gelatin

11. Milk:

NOTE: The starred foods are relatively high in fat content; use such foods moderately.

  - Buttermilk
  - Condensed milk
  - Malted milk

12. Nuts of all kinds
    - Peanut butter
13. Pies (except mincemeat)
14. Shad roe
15. Sugars and sweets
16. Vegetables:
    - Artichokes
    - Beets
    - Beet greens
    - Broccoli
    - Brussels sprouts
    - Cabbage
    - Carrots
    - Celery
    - Corn
    - Cucumbers
    - Dandelion greens
    - Eggplant
    - Endive
    - Green peppers
    - Kohlrabi
    - Lettuce
    - Okra
    - Parsnips
    - Potato
      - Sweet
      - White
    - Pumpkin
    - Radishes
    - Rutabagas
    - Sauerkraut
    - String beans
    - Summer squash
    - Tomato
    - Swiss chard
    - Turnips
17. Vegetable soups (without meat)
18. Vitamin concentrates:
    - Cod-liver oil
    - Halibut oil
    - Yeast

TYPICAL FOODS ALLOWED OCCASIONALLY IN THE TREATMENT OF GOUT

List 2

Foods which contain a moderate amount (up to 75 mg.) of purine bodies in 100 Gm. When on a low purine diet, only 3 servings per week are allowed—*each* on different days.

Asparagus
Bluefish
Bouillon
Cauliflower
Chicken
Crab
Eel
Finnan haddie
Ham
Herring
Kidney beans
Lima beans
Lobster
Mushrooms
Mutton
Navy beans
Onions
Oysters
Peas
Salmon
Shad
Spinach
Tripe
Tuna fish
Whitefish

Whole-grain bread and breadstuffs:

Graham bread
Graham crackers
Bemax
Bran
Bran flakes
Cracked wheat
Embo
Graham porridge
Grapenuts
Krumbles
Malt Breakfast Food
Oatmeal
Oatmeal crackers
Rye Krisp
Whole-wheat bread
Pep bran flakes
Pettijohn
Ralston
Sims
Shredded wheat
Wheaties
Wheat oats
Wheatsworth
Whole-wheat Krumbles

List 3

Foods which contain a large amount (75–150 mg.) of purine bodies in 100 Gm. When a low purine diet, only 2 servings per week are allowed—*each* on different days.

Bacon
Beef
Calf tongue
Carp
Chicken soup
Codfish
Duck
Goose
Halibut
Lentils
Liver
Sausage
Meat soups
Partridge
Perch
Pheasant
Pigeon
Pike
Plaice
Pork
Quail
Rabbit
Sheep
Shellfish
Squab
Trout
Turkey
Veal
Venison

TYPICAL FOODS TO AVOID IN THE TREATMENT OF GOUT

List 4

Foods which contain a very larg amount (150–1,000 mg.) of purin bodies in 100 Gm. *Avoid entirely.*

Sweetbreads	825 m
Anchovies	363 m
Sardines (in oil)	295 m
Liver (calf, beef)	233 m
Kidneys (beef)	200 m

Brains	195 mg.
Meat extracts	160–400 mg.
Gravies	

To calculate the purines or purine bodies in a given food, the purine nitrogen is multiplied by 3. For example, 200 mg. of purine nitrogen equal 600 mg. of purine bodies.

AVOID THE FOLLOWING

Catsup, spice, cinnamon, cloves, dill, horse-radish, garlic, mustard, nutmeg, paprika, parsley, pepper, relishes and other spices and condiments.

Alcoholic beverages.

INSTRUCTIONS

You are allowed at all times foods in List 1 consistent with the maintenance of normal weight and the avoidance of obesity.

You are allowed foods in List 2, 3 servings per week, each on different days, *when on low purine diet.*

You are allowed foods in List 3, 2 servings per week, each on different days, *when on low purine diet.*

When meat or fish are allowed, it is well not to eat more than 3 servings per week.

When you have an attack, or when you feel that you may have one, go on the purine-free diet temporarily (List 1).

On the days on which cinchophen is taken, be sure to partake freely of the carbohydrate foods; that is, of the foods high in sugar and starch—jams, jellies, fruit juices, etc. Carbohydrate foods are very important when cinchophen is being taken.

Purine-free Diet

60 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 145, Protein 60, Fat 65, Calories 1,415

Food	*Gram Weight*	*Household Measure*
Cereal (cooked) *	280	1⅓ cups
Bread	90	3 slices
Butter	25	2½ squares
Salad dressing with oil		
Milk (skimmed)	600	3 glasses
Cream, 20%	60	¼ cup or 4 tablespoons
Cream, 40%		
Meat (lean)		
Bacon		
Egg	200	4
Vegetables, 3%		
Vegetables, 6%		
Fruit, 5% Fruit, 10%	300	3 servings

* Prepared cereal may be substituted for the cooked cereal.

Purine-free Diet

60 Gm. Protein
1,400 Calories

Suggested Distribution of the Total Food Allowance for One Day

BREAKFAST		
		Gm.
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread	1 slice	30
Butter	½ square	5
Cream, 20%	2 tablespoons	30
Milk	1 glass	200
Beverage—coffee substitute		
LUNCHEON		
Egg or egg substitute*	1	50
Bread	1 slice	30
Butter	1 square	10
Fruit, 5 or 10%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Egg or egg substitute	1	50
Cereal	⅔ cup	140
Cream, 20%	2 tablespoons	30
Bread	1 slice	30
Butter	1 square	10
Fruit, 5 or 10%	1 serving	100
Milk (skimmed)	1 glass	200

* May substitute milk or cheese, but not meat, for the egg in the purine-free diets.

Purine-free Diet

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 190, Protein 60, Fat 90, Calories 1,810

Food	*Weight Gram*	*Household Measure*
Cereal (cooked)	280	1⅓ cups
Bread	90	3 slices
Butter	25	2½ squares
Salad dressing with oil		
Milk	500	2½ glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)		
Bacon		
Egg	200	4
Vegetables, 3%		
Vegetables, 6%		
Fruit, 5% Fruit, 10%	300	3 servings
Fruit juice, 10%	200	1 glass
Dessert	100	1 serving

Purine-free Diet

60 Gm. Protein
1,800 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread (toast)	1 slice	30
Butter	½ square	5
Cream, 20%	¼ cup	30
Milk	½ glass	100
Beverage—coffee substitute		
LUNCHEON		
Egg or egg substitute	1	50
Bread	1 slice	30
Butter	1 square	10
Fruit, 5 or 10%	1 serving	100
Milk	1 glass	200
Fruit juice, 10%	1 glass	200
DINNER		
Egg or egg substitute	1	50
Cereal	⅔ cup	140
Bread	1 slice	30
Butter	1 square	10
Fruit, 5 or 10%	1 serving	100
Milk	1 glass	200
Dessert	1 serving	100

Low Purine—Without Meat

60 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 135, Protein 60, Fat 70, Calories 1,410

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	30	3 squares
Salad dressing with oil		
Milk (skimmed)	600	3 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)		
Bacon		
Egg	200	4
Vegetables, 3% Vegetables, 6%	300	4 small servings
Fruit, 5% Fruit, 10%	300	3 servings
Potato or substitute	75	1 small serving

Low Purine—Without Meat

60 Gm. Protein
1,400 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Milk (skimmed)	1 glass	200
Beverage–coffee substitute		
LUNCHEON		
Egg or egg substitute*	1	50
Vegetables	2 small servings	150
Bread	1 thin slice	20
Butter	1 square	10
Fruit, 5 or 10%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Egg or egg substitute	1	50
Potato or substitute	1 small serving	75
Vegetable	1 small serving	75
Salad: vegetable	1 small serving	75
Bread	1 thin slice	20
Butter	1 square	10
Fruit, 5 or 10%	1 serving	100
Milk (skimmed)	1 glass	200

* May substitute milk or cheese, but not meat, in the low purine diets.

Low Purine—Without Meat

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 170, Protein 60, Fat 100, Calories 1,820

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	45	4½ squares
Salad dressing with oil		
Milk	600	3 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)		
Egg	200	4
Vegetables, 3% Vegetables, 6%	300	4 small servings
Fruit, 5% Fruit, 10%	300	3 small servings
Potato or substitute	150	2 small servings
Sugar	15	1 tablespoon

Low Purine—Without Meat

60 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Milk	1 glass	200
Sugar	1 tablespoon	15
Beverage—coffee substitute		
LUNCHEON		
Egg or egg substitute*	1	50
Potato or substitute	1 small serving	75
Vegetables	2 small servings	150
Bread	1 thin slice	20
Butter	1½ squares	15
Fruit, 5 or 10%	1 serving	100
Milk	1 glass	200
DINNER		
Egg or egg substitute	1	50
Potato or substitute	1 small serving	75
Vegetable	1 small serving	75
Salad: fresh vegetable	1 small serving	75
Bread	1 thin slice	20
Butter	2 squares	20
Fruit, 5 or 10%	1 serving	100
Milk	1 glass	200

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* May substitute milk or cheese, but not meat, in low purine diets.

Low Purine—Without Meat

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 205, Protein 60, Fat 125, Calories 2,185

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	40	4 squares
Salad dressing with oil	30	2 tablespoons
Milk	600	3 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)		
Bacon		
Egg	150	3
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	150	2 small servings
Dessert	100	1 serving

Low Purine—Without Meat

60 Gm. Protein
2,200 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Milk	1 glass	200
Beverage—coffee substitute		
LUNCHEON		
Egg or egg substitute*	1	50
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Salad:		
Vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	1½ squares	15
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Egg or egg substitute	1	50
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	1½ squares	15
Dessert	1 serving	100
Milk	1 glass	200

* May substitute milk or cheese, but not meat, in the low purine diets.

Low Purine—With Meat

60 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 145, Protein 60, Fat 65, Calories 1,415

Food	*Gram Weight*	*Household Measure*
Cereal (cooked) *	140	⅔ cup
Bread	90	3 slices
Butter	30	3 squares
Salad dressing with oil		
Milk (skimmed)	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	4 small servings
Fruit, 10%	300	3 servings
Potato or substitute	75	1 small serving

* Prepared cereal may be substituted for the cooked cereal.

Low Purine—With Meat

60 Gm. Protein
1,400 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee substitute		
LUNCHEON		
Egg or egg substitute	1	50
Vegetables, 3 or 6%	1 small serving	75
Fresh vegetable salad, 3%	1 small serving	75
Bread	1 slice	30
Butter	1 square	10
Fruit, 5 or 10%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 3 or 6%	1 small serving	75
Salad: vegetable	1 small serving	75
Bread	1 slice	30
Butter	1 square	10
Fruit, 5 or 10%	1 serving	100
Milk (skimmed)	1 glass	200

Low Purine—With Meat

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 170, Protein 60, Fat 100, Calories 1,820

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	55	5½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	4 small servings
Fruit, 5% Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	150	2 small servings

Low Purine—With Meat

60 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread	1 slice	30
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Beverage—coffee substitute		
LUNCHEON		
Egg or egg substitute	1	50
Potato or substitute	1 small serving	75
Vegetable, 3 or 6%	1 small serving	75
Vegetable salad, 3%	1 small serving	75
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 3 or 6%	1 small serving	75
Salad: vegetable, 3 or 6%	1 small serving	75
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200

Low Purine—With Meat

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 200, Protein 60, Fat 130, Calories 2,210

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	50	5 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 5% Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	150	2 small servings
Dessert	100	1 serving

Low Purine—With Meat

60 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee substitute		
LUNCHEON		
Egg or egg substitute	1	50
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Salad:		
Fresh vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Dessert	1 serving	100
Milk	1 glass	200

Low Purine—With Meat

70 Gm. Protein
1,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 277, Protein 70, Fat 26, Calories 1,623

Food	*Gram Weight*	*Household Measure*
Cereal (cooked) *	140	⅔ cup
Bread	120	4 slices
Salad dressing with oil		
Milk (skimmed)	400	2 glasses
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	50	1
Vegetables, 3% or 6%	300	4 small servings
Vegetables, 20%	100	1 serving
Fruit, 10%	300	3 servings
Potato or substitute	200	2 servings
Fruit juice, 10%	200	1 glass
Crackers, soda	40	6 crackers
Jelly, honey or sugar	25	5 teaspoons

* Prepared cereal may be substituted for the cooked cereal.

Low Purine—With Meat

70 Gm. Protein
1,600 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

BREAKFAST

		Gm.
Fruit juice, 10%	1 glass	200
Cereal (cooked)	⅔ cup	140
Bread	2 slices	60
Jelly or honey	2 teaspoons	10
Beverage–coffee substitute		

LUNCHEON

Egg or egg substitute	1	50
Vegetables, 3 or 6%	1 small serving	75
Fresh vegetable salad, 3%	1 small serving	75
Bread	1 slice	30
Fruit, 10%	1 serving	100
Milk (skimmed)	1 glass	200
Potato or substitute	1 serving	100
Soda crackers	3	20
Vegetable, 20%	1 serving	100
Jelly or honey	2 teaspoons	10

DINNER

Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetables, 3 or 6%	1 small serving	75
Salad: vegetable, 3%	1 small serving	75
Bread	1 slice	30
Soda crackers	3	20
Jelly or honey	1 teaspoon	5
Fruit, 10%	2 servings	200
Milk (skimmed)	1 glass	200

Metabolic Diseases *(Continued)*

OVERWEIGHT—OBESITY

Nature of the Condition

Presence of excessive amount of body weight

Object of Diet

Caloric intake below energy requirements

Overweight implies that there is present in the individual an increase of weight above normal but not necessarily an excessive amount of body fat.

An individual who is not only overweight but who has an excessive amount of body fat deposited as an inert storage tissue is called obese.

IMPORTANT FACTORS IN DIETARY TREATMENT OF OVERWEIGHT—OBESITY

1. Calories: Low
2. Protein: Adequate
3. Carbohydrate: Moderately low
4. Fat: Very low
5. Sufficient bulk to satisfy hunger

These factors are now discussed briefly:

Calories: Low. The caloric intake of the particular individual is the first thing to be considered, and, of course, it must be below his energy requirement. The calories should be high enough to meet adequately the needs of the body and teach good food habits. One should choose a caloric intake of from 800 to 1,400 calories per day, depending upon the amount of overweight, the rate at which one desires to reduce, the expected or ideal weight desired, and whether there are any associated problems or complications. Too low a caloric intake is not a good procedure to follow routinely, because it does not allow for good food habits and adequate intake of vitamins and minerals. It has poor satiety value and may cause too rapid a reduction of weight with too rapid changes in the tone of the tissues.

Protein: Adequate. The protein intake must be adequate to maintain nitrogen equilibrium. This may be covered by using 1 Gm. of protein per Kg. of expected or ideal weight. In addition to the protection of nitrogen balance one should choose proteins of high biologic values, so as to ensure the necessary amount of all the amino acids that aid in the building of the body's tissues. Such proteins are meat, eggs, milk and cheese.

Carbohydrate: Moderately Low. The carbohydrate content of the reduction diet must be quite limited if much weight is to be lost, yet high enough to maintain nitrogen equilibrium. Strang, McClugage and Evans report that 0.6 Gm. of carbohydrate for every gram of protein used is necessary in a reducing regimen to maintain nitrogen balance. Carbohydrate acts as a protein sparer by protecting the antiketogenic fraction of the protein molecule from being transformed into available glucose. In our plan of a reduction diet we use 0.85 Gm. of carbohydrate for each gram of protein used in the diet. In many patients whose expected body weight is from 160 to 200 lbs., we have had good results by using as much as from 1 to 1½ Gm. carbohydrate for each gram of protein used in the diet. This amount is safely above the minimum requirement to preserve nitrogen balance and ensures an acid-base equilibrium, avoiding the dehydration effects of acidosis or the hydrophilic tendency of the tissues with alkalosis.

Fat: Very Low. Fat is the one foodstuff that must of necessity be very low in amount because of the number of calories allowed in a reduction diet and the high caloric value of the fat as compared with the carbohydrate and the protein. The purpose of the diet is to give very little fat by mouth in order that the body may use up its own fatty tissues to make up the deficient caloric intake of energy requirements.

Sufficient Bulk to Satisfy Hunger. The satiety value of the diet is very important. The diet should be planned so that the individual will not be hungry and at the same time be able to carry on his normal activity. Liberal quantities of green vegetables are given so as to supply sufficient bulk and roughage to aid in bowel elimination and to satisfy hunger. Meat is one of the foods that has a particularly high satiety value. The use of a small amount of fruits at the end of a meal aids a great deal in giving a sense of fullness and satisfaction. Clear meat broths (without fat) are also an aid and have no food value.

Such a program will ensure a normal metabolizing mixture, regardless of the calories given by mouth. In addition, the patient will not ordinarily experience any clinical discomfort after the first few days and will tend to lose weight uniformly. It is best to reduce weight gradually by prolonging the period of dieting. The advantage in this is that it accustoms the patient to a small amount of food, so that he is not likely to overeat after the weight has been sufficiently reduced. Also, slow reduction lessens the chances of weakening the patient.

General Consideration of Obesity Problems

Disorders of metabolism are frequently encountered in medical practice. One of the commonest is obesity. Failure on the part of the physician to understand the proper management of obesity, or to be sympathetic and interested in directing reducing measures for the patient seeking his counsel, results all too frequently in the overweight individual's seeking relief by quack remedies, which in many instances lead to definite harm to body tissues and to the health. The reason for the various quack remedies for obesity, with their ridiculous measures and unscientific diets, can unquestionably be traced to the failure of the medical profession to give the subect proper consideration. The laity should be taught that to be overweight beyond a certain limit may be the sign of some serious metabolic disturbance, and that relief should be sought early.

With the changes in the mode of living that characterize present-day urban existence, a considerable proportion of the adult population indulges in comparatively little muscular activity. Eating habits developed during adolescence, when the demands of physical activity necessitated a large food intake, may be continued after the need for a high energy intake has ceased. It is hard for most people to believe how a small quantity of food can influence weight. An intake of 100 calories a day above the energy expenditure means an increase in weight of about 10 lbs. in a year. Reducing by increased exercise is not an easy matter; frequently it is ineffective, and in some cases may even be injurious. Those who wish to get rid of accumulated body fat must eat fewer calories than they expend in activity.

The apparent paradox that certain persons get fat and others do not on what appear to be equivalent diets invites much speculation. The old classification of exogenous obesity attributed to inactivity and overfeeding and endogenous obesity, or the constitutional type, for which a variety of physiologic and pathologic functions have been ascribed, is subject to attack on the basis of Newburgh's contention of obesity; namely, that the individual takes in more than is used up, regardless of any disease or any inherited tendency which may be present.

The problem of obesity is difficult to solve because, perhaps as DuBois has stated, there is no stranger phenomenon than the maintenance of a constant body weight under marked variation in bodily activity and consumption of food. Few scientific data are available to explain maintenance of normal weight. Many factors, such as disturbance of endocrine glands, water metabolism, specific dynamic action and fluctuations in basal metabolism, have been held responsible. Such data as Newburgh has presented recently in determining the total heat elimination and total water exchange, with accurate studies of the nature of obesity, do not lend support to the conception of a mysterious economy practiced by the tissues infiltrated with fat.

Important Cause of Failure in Treatment. One of the chief causes of failure in the treatment of many cases of obesity, at least of the simple forms, has been the lack of perseverance and courage to follow a restricted regimen long enough to overcome the tendency on the part of the water to be retained by the tissues to compensate for the fat oxidized. It is known that occasionally, although a patient is on a reduction diet and is actually oxidizing tissue, the scale will not show the loss and will even show a gain for days because water is retained to replace the fat burned. Following this, diuresis takes place, and there is a rapid loss in weight. The steplike fashion of reduction has been observed by both laymen and physicians.

While it may be convenient to attempt to classify obesity, it is impossible to give a classification because of the insufficiency of our knowledge of its pathology. There can be no doubt that obesity is often the result of overindulgence in food and lack of exercise. However, there apparently are persons who gain weight while taking what appears to be a moderate or even a restricted amount of food and indulging in considerable exercise. In many instances there seems to be a hereditary background, as though there were a constitutional tendency to obesity. There is also a group of diseases, such as hypopituitarism, adiposogenital dystrophia, hypothyroidism, myxedema, obesity of genital origin, lipomatosis and adiposis dolorosa, all of which tend to have a common feature, which is a disturbance of metabolism leading to the abnormal deposition of fat with certain regional distributions and peculiar configurations.

Factors Tending to Produce Obesity. Many common factors may be observed in the accumulation of evidence on the incidence of the development of obesity. In many cases obesity develops following lactation, because the young mother in her zeal to supply adequate nourishment for her baby overeats and pushes fluid to a maximum. It is common for obesity to follow convalescence from operation or from prolonged illness. There are natural periods of alteration of flesh, as at puberty, the menses, pregnancy and the menopause. Between 30 and 40 years of age there is a tendency for a gain of from 10 to 20 pounds, and again at about 50 years. After 55 or 60 an appreciable natural diminution in weight tends to take place.

The problem of obesity in its many aspects has received more attention in recent years and is becoming a significant factor in clinical practice. One of the chief reasons for bringing most obese women to the physician is the lack of grace and beauty of figure which, in turn, is likely to bring about certain psychic effects. Fashion in recent years has decreed that the female figure be slight and sylphlike. To conform to this, many women have attempted, on their own initiative, many ridiculous dietary measures, and not infrequently these have led to extreme undernutrition, ill-health, and even death. As a matter of fact, the final impetus that brings the obese person to the physician is one of the sequelæ of obesity rather than the esthetic considerations. Certainly it is the adverse effect on longevity and the predisposition to secondary pathologic changes that should concern the physician.

The medical actuarial tables on mortality statistics quickly point out the effects of obesity on the duration of life. The per cent ratio of actual to expectant death of overweight men and women increases proportionately to each 10 pounds of overweight. This fact is recognized by insurance companies; they regard obesity as a serious impairment, and the obese person who desires life insurance has his rate increased considerably because of the extra risk associated.

Relation of Obesity to Other Conditions. Not alone does the obese individual have physical and economic handicaps, but the abnormal adiposity predisposes to other pathologic conditions. Joslin has emphasized the relation of obesity to diabetes. He found that from 70 to 85 per cent of persons with diabetes gave a history of obesity. If there is a latent tendency to diabetes, the development of obesity certainly seems to precipitate glycosuria. It is surprising how often the history of obesity is present at the onset of glycosuria. Furthermore, the carbohydrate metabolism seems to be altered, because from 40 to 60 per cent of all obese persons have an abnormal glucose tolerance. Foster stated that 50 per cent of the patients with hypertension were obese. A large proportion of patients with cholelithiasis are overweight. The development of cardiac embarrassment is likewise a common observation. There are also many minor difficulties that arise from obesity, such as varicosities, excessive perspiration and eczema. The surgeon is well aware that the obese patient is a poor surgical risk, presenting the possibility of postoperative hernia and a tendency to pneumonia. Many orthopedic problems are aggravated or precipitated by overweight. It has long been known that a certain relation exists between obesity and complete or partial sterility. Some authorities feel that obesity is an exciting cause of sterility, although other factors suggest that sterility is primary and that obesity supervenes as a result of metabolic disturbances produced by the elimination of the reproductive functions.

From this brief review it is apparent that obesity, regardless of the mechanism by which it may be produced, from a simple gain of from 10 to 20 per cent above the normal weight for a certain height, sex and age, up to veritable monstrosity, should be considered pathologic.

The diagnosis of obesity usually presents very little difficulty. The physical appearance of the individual is sufficient ordinarily to make the diagnosis simple, even for the layman. Obesity does not develop rapidly in the average person, and it is usually well advanced before he seeks medical advice.

One must, of course, differentiate among myxedema, edema and avitaminosis.

Myxedema. Usually the patient has associated symptoms of hypothyroidism such as a dry skin, dry and brittle hair, mental retardation, typical facial appearance, intolerance to cold and, of course, the laboratory evidence characteristic of the disease.

Edema. Occasionally widespread involvement of anasarca or ascites may superficially resemble obesity. However, careful physical examination will usually make the differentiation clear.

Avitaminosis. In times of economic depression and in certain long-standing cases of poor food habits, or foolish and inadequate diet, there is apt to be a vitamin and mineral deficiency, and patients may develop a certain amount of subcutaneous edema and a puffy appearance of the skin which simulates obesity. A careful food history should be obtained; the apparent obesity will usually disappear rapidly with a diet that is adequate in vitamins and in calories.

With these factors eliminated, it is important, both from the standpoint of completeness of diagnosis and as a guide to correct therapy, to make an effort to classify the patient as to his type of obesity.

TYPES OF OBESITY

Various endocrine dysfunctions are accompanied often by different types of adiposity and certain regional distributions and peculiar configurations.

Many enthusiasts have suggested that all cases of obesity are due to some fault of the endocrine system. Foreign investigators particularly have emphasized this etiologic factor. It requires considerable study and observation to classify definitely any case of obesity, and the tendency to attribute all adiposity to endocrinopathy must continually be guarded against.

Unquestionably certain cases of obesity have been linked definitely with endocrinopathies, such as pituitary syndromes of adiposis dolorosa. Fröhlich's syndrome, pituitary basophilism, the generalized adiposity of certain cases of hypothyroidism, the eunuchoid type of obesity and the obesity of hyperadrenalism.

Many other cases of obesity may be of endocrine origin, but there is no justification for classifying them as such unless there is some definite proof of faulty function of some of the glands of internal secretion. In other words, the tendency should be not to suspect a case of obesity as due to faults of glands of internal secretion until the more common causes have been ruled out.

The endocrinopathies which have been associated with obesity are listed below.

Thyroid hypofunction may possibly cause increased storage of fat by decreasing the basal metabolic rate and thus allowing insufficient output of energy to balance the increase in calories. On the other hand, it should not be forgotten that many patients with hypothyroidism are below the average weight. As a matter of fact, in observing the studies of the basal metabolism associated with obesity it is surprising to note how few cases actually have hypothyroidism. Evans and Strang were the first to emphasize the importance of the correct method of calculating the basal metabolic rate in obese patients. They stated that the weight used should be the ideal or expected weight rather than the actual weight. As a matter of fact, in order to justify the diagnosis of hypothyroidism in the presence of obesity, the basal metabolic rate must be below normal when the calculation is made according to the ideal weight rather than the actual weight of the patient, or the patient must present definite clinical symptoms of myxedema.

Pituitary dysfunction has been thought for many years to be the cause of certain types of obesity such as adiposogenital dystrophia, adiposis dolorosa (Dercum's disease), the adiposity of pituitary basophilism (Cushing's disease) and others. The work of certain investigators suggests that these conditions might not be due so much to the disturbance of the pituitary itself as possibly to the irritation of the underlying brain structure. Evans' work, in which hypophysectomies without injury to the underlying brain tissue are regularly followed by perfect dwarfism without any trace of adiposity, is exceedingly interesting. The work of Anselmino and Hoffman indicates that there may be a hormone elaborated by the anterior lobe of the pituitary that has something to do with fat metabolism.

Adrenals. It is thought by some investigators that a hormone from the adrenal cortex fixes the blood fats of the tissues. If the adrenal produces obesity, it does so by just the opposite mechanism to that of the thyroid. That is to say, hypofunction of the adrenals causes weakness and decreased nutrition, while in hyperadrenalism there is every evidence of exaggerated metabolism. Koster and his associates recently have removed the suprarenal glands with relief of the obesity.

Gonads. Hypofunction of the ovaries has been recognized for many years as one of the most important endocrine causes of obesity. The majority of cases of ovarian failure show an increased tendency to gain weight. This is particularly true of cases of obesity occurring before the menopause. The frequent tendency for obesity to develop in patients when there is ovarian unrest, as at puberty, in sexual activity, pregnancy, lactation and the menopause, seems to indicate that the ovaries play an important role. Castration or testicular failure in the male causes a definite excess of adiposity.

Central Nervous Lesions. Weir Mitchell in 1880 suggested what he called a fat center, which is located in the posterior part of the medulla. This so-called nervous or central theory has been revived by Bernhardt in Germany and Wilder in the United States. Wilder suggests that the center is one of the visceral nuclei of the tuber cinereum and the walls of the fourth ventricle. The mechanism of accomplishment is of course problematical, although Wilder feels it is indirectly through the control of the appetite.

Defective water and salt metabolism leads to overweight, but this is not a true obesity.

Accessory Factors in Treatment of Obesity

Exercise. The amount of exercise should be increased, unless obesity is complicated by disease, in which case exercise is contraindicated.

Water Allowance. Water may be taken as is the habit of the individual. There is no reason to restrict water greatly unless the obesity is complicated by a disease in which limitation of water may be desirable.

Vitamins. In order to keep the protective nutrients high, a reducing diet should provide lean meat or lean fish, eggs, skimmed milk or buttermilk, leafy vegetables, a salad, 2 fresh fruits and some butter daily. Vitamins A, C and D are usually furnished in sufficient amounts in reduction diets, but thiamine and the other members of the B complex, which usually occur in less than optimal amounts in reducing diets, must be supplied as concentrated supplements. Two important points should be borne in mind in obese patients from the standpoint of vitamins: first, the diet for weight reduction must supply adequate amounts of vitamins and minerals, otherwise as a result of severe dietary restriction the patient may develop well-defined evidences of deficiency disease; second, certain patients on exceedingly high carbohydrate, low protein, low fat diets will have evidences of a malnutrition (B complex deficiency states) in spite of their overnutrition (obesity).

Plate 10 shows an overnourished patient weighing 260 lbs. who had been living on a very high carbohydrate, low fat, moderately low protein diet for a prolonged period of about 3 years. She presented the physical signs of cheilosis, paranasal seborrheic dermatitis, an injected conjunctiva, photophobia, red tongue with glossitis and atrophic papillae.

Often the deficiency state in such a finding will be overcome spontaneously by placing the patient on a reduction diet with high protective foods, giving from 1 to 1½ Gm. of protein, 1 Gm. of carbohydrate for each kilogram of expected weight reduction and fat to allow from 1,000 to 1,200 calories.

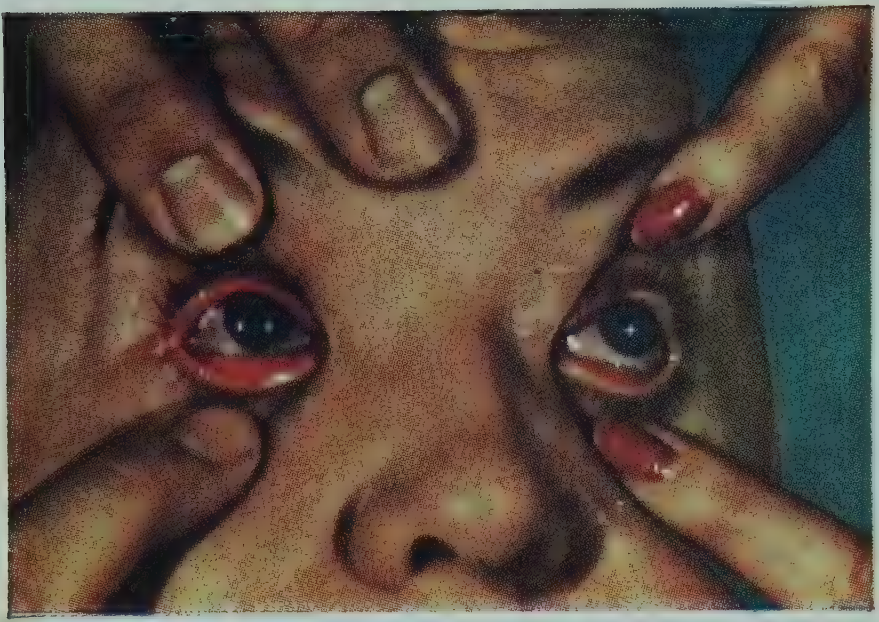
High carbohydrate diets do not increase the total metabolism, but increase the number of nonfat calories consumed and therefore increase the requirement of vitamin B_1. The long-continued intake of very high carbohydrate diets by patients on a poor protective dietary intake may precipitate deficiency states. When glucose is administered intravenously or a very high carbohydrate diet is given over a very prolonged period (with a poor or low protein, low fat intake), thiamine, niacin and riboflavin should be given as well. Excessive carbohydrate in the diet can also induce deficiency disease, and beriberi due to this cause has, in fact, been reported.

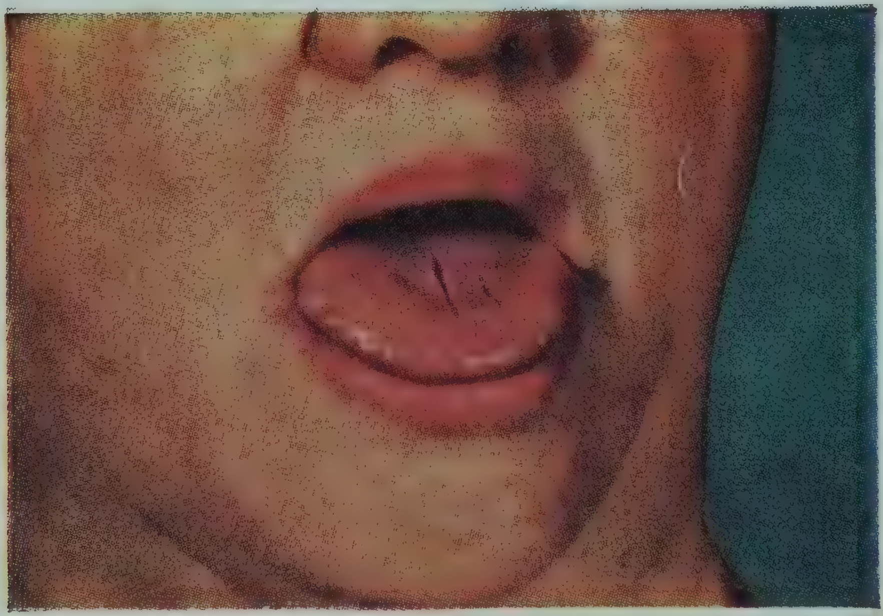
It has been shown that both protein and fat have a thiamine-sparing action. The vitamin B_1 requirements of an animal are less on a diet rich in fat than on one containing much carbohydrate.

Lowered carbohydrate, with good protein availability and with high fat oxidation in the reducing process, all sparing the thiamine needs, as in this case (Plate 10), caused a disappearance of the deficiency state without any added vitamin supplement. However, the use of water-soluble vitamin supplements hastens the recovery of an associated deficiency if it is present.

Thyroid Medication. Physicians cannot be too strongly cautioned against promiscuous and indiscriminate use of thyroid gland in the treatment of obesity, especially by the laity. The use of thyroid extract outside the well-controlled advice of a physician is pernicious, because it fre-

PLATE 10





Obesity patient with deficiency disease. (*Top*) Injected conjunctiva, photophobia and paranasal seborrheic dermatitis. (*Bottom*) Cheilosis, fissuring at the angles of the mouth, red tongue with glossitis and atrophic papillae.

quently leads to material cardiac injury when taken for long periods or in too large doses. If the physician can observe patients daily and can make frequent tests of basal metabolism, it aids materially in reducing the weight rapidly, and under certain conditions may be safely employed.

Benzedrine Sulfate. Many drugs have been used to depress the excessive appetite of the obesity patient and so decrease the caloric intake. With the exception of benzedrine sulfate, all have proved short-lived. Benzedrine helps to overcome the psychoneurotic state often responsible for overeating, as a release for nervous energy. Many patients will resort to excessive eating in order to overcome disappointments, fears and anxieties. A patient given benzedrine sulfate experiences a sense of well-being and a loss of appetite and, as a result, is better able to adhere strictly to a submaintenance diet and so lose weight. The action of benzedrine sulfate in curbing appetite is still obscure. Its influence seems to be central, but it may be that it depresses gastric motility and hunger.

Two forms of benzedrine (amphetamine sulfate) are used in the treatment of obesity: the dextrorotatory and the levorotatory. Published results appear to favor the d-amphetamine. Generally, the dosage is from 2.5 to 5 mg. each and is administered at mealtimes. In order to prevent insomnia, it is best not to administer benzedrine during the late afternoon hours. After the patient starts a reduction diet, he is given, for the first few days, from 2.5 to 5 mg. of benzedrine sulfate daily. After the first few days, the dose is gradually increased, but it is never allowed to exceed 30 mg. daily.

The chief objection to benzedrine is that, since it has an accumulative effect, it cannot be taken continually. Some patients become rapidly tolerant of the drug and there are certain cases on record of addiction to it. In some cases, benzedrine causes mental agitation, insomnia or tachycardia. If and when the drug is used, it should be given with great caution and observance of the factors just discussed.

Diuretics. Some women retain water premenstrually and may show an actual gain in weight a few days before menstruation. Unless the cause is understood, this failure to lose weight may be discouraging to both patient and physician.

Mercury Drugs. Occasionally one may use a diuretic containing mercury such as salyrgan or mercupurin to aid the elimination of water in obesity. As recently as 1941, Bauer recommended their use for the same purpose. Of the 2 mercury diuretics just mentioned, mercupurin may be considered the better, since it can be injected intramuscularly.

Dinitrophenol. The use of this substance in the treatment of obesity apparently has run its course, and the consensus of opinion seems to be that the danger attending its use outweighs its advantages. The splendid comprehensive clinical report by Simkins should be read by anyone who contemplates resorting to the use of this drug.

Directions for Application of Diets

For reduction of overweight of only a few pounds, one can ordinarily attain the desired weight by restricting the obvious fats and the more concentrated carbohydrates of the diet. This may be done by following the typical foods allowed and curtailing those to avoid (pp. 204 and 205).

For the cases of obesity needing greater dietary restriction we have presented three series of reduction diets, calculated by applying the important factors outlined above, on the basis of an expected or ideal weight of 120, 160 and 200 lbs., with varying caloric values of from 800 to 1,400 calories per day. Diets as low as 800 calories are arranged with adequate vitamins, minerals and salts.

The ideal weight of any individual is determined usually by consulting tables of actuarial standards, the weight being chosen on the basis of height, age and sex. Such a table is on page 691. It must be remembered that most of the tables of actuarial standards for ideal weight and height are prepared for insurance companies. These tables should serve as an approximate guide and should not be followed exactly. One must take into consideration each individual and use as a goal the best expected or ideal weight for his particular needs, both mental and physical.

Regardless of what the ideal weight should be, the first reduction diet chosen should seldom be more than from 20 to 40 lbs. below the present weight of the individual, depending on the type and the degree of obesity and the patient's tolerance of the loss of weight. For example, a patient weighing approximately 240 lbs. should use one of the diets outlined on the basis of an expected weight of 200 lbs. A patient weighing approximately 200 lbs. should be started on one of the diets outlined on the basis of an expected weight of 160 lbs.

When a reduction of from 10 to 40 lbs. has been obtained, it is well to add enough food to any diet used so as to maintain the new weight for a period of from 2 to 4 months. This will allow the body to readjust its metabolism for this newly attained weight prior to further reduction if necessary. The only exceptions to this rule are the cases in which obesity for certain definite reasons requires very rapid reduction, or cases of extreme obesity in which the individual weighs from 280 to 350 lbs.

During this reduction regimen one should weigh only once a week, but on the same scales, at the same time of day and before the meal. The approximate average mineral content of the reduction diets for each expected or ideal weight outlined are:

EXPECTED WEIGHT	CALCIUM	PHOSPHORUS	IRON
120 lbs.	.678	.926	.0111
160 lbs.	.783	1.188	.0134
200 lbs.	.880	1.146	.0169

A few suggested substitutions for use in reduction diets are given on page 205.

SIMPLE QUALITATIVE RESTRICTION

Typical Foods Allowed in Reduction Diets:

Milk, skimmed and buttermilk
Egg
Meat, lean
Meats low in fat, such as:
  Chicken–lean portion
  Liver
  Fish, other than salmon
  Shrimp
  Crabmeat
Fruit, 5 and 10%
Vegetables, 3 and 6%
Clear soup

Typical Foods to Avoid in Reduction Diets:

Sugar and All Sweets

Starches:
  Bread
  Cereals
  Macaroni
  Spaghetti
  Pastry, pie, cakes
  Sweet desserts

Vegetables High in Carbohydrates:
  Potato
  Shelled peas

- Shelled beans
- Corn
- Parsnips

Fats:

- Butter
- Salad oils
- Cream

Meats high in fat:

- Pork
- Lamb chop with large amounts of fat

A Few Suggested Substitutions for Reduction Diets

In place of 10 Gm., ½ thin slice, of bread,* substitute one of the following:

Skim milk	100 Gm.	½ glass
Vegetable, 6%	100 Gm.	1 serving
Vegetable, 3%	300 Gm.	2 servings
Fruit, 5%	100 Gm.	1 serving
Fruit, 10%	50 Gm.	½ serving

In place of 10 Gm. of butter, 1 square, substitute one of the following:

Salad dressing with oil	10 Gm.	2 teaspoons
Cream, 20%	15 Gm.	1 tablespoon

In place of 60 Gm. meat, 2 oz., and 15 Gm. cream, 1 tablespoon, substitute one of the following:

Egg	2	
Solid cheese	40 Gm.	2 one-inch cubes

In place of 100 Gm. 10% fruit, 1 serving, substitute one of the following:

Fruit, 5%	200 Gm.	2 servings
Vegetable, 6%	150 Gm.	2 small servings
Vegetable, 3%	300 Gm.	3 servings

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* Other foods may be substituted for the bread allowance; bread cannot be substituted for other foods.

Reduction Diet for Expected or Ideal Weight of 120 lbs.

800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 46, Protein 54, Fat 46, Calories 814

Food	*Gram Weight*	*Household Measure*
Cereal (dry)		
Bread		
Muffin (soybean)		
Butter	10	1 square
Salad dressing with oil		
Milk (skimmed)	300	1½ glasses
Cream, 20%	30	2 tablespoons
Cream, 40%		
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3%	300	4 small servings; 1½ cups
Vegetables, 6%		
Fruit, 5%	200	2 servings
Fruit, 10%	100	1 serving
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Reduction Diet for Expected or Ideal Weight of 120 lbs.

800 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	2 slices, crisp	10
Egg	1	50
Cream, 20%	2 tablespoons	30
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetables, 3%	2 small servings	150
Butter	½ square	5
Fruit, 5%	1 serving	100
Milk (skimmed)	¾ glass	150
DINNER		
Meat	1 serving	60
Vegetables, 3%	1 small serving	75
Salad: vegetable, 3%	1 small serving	75
Butter	½ square	5
Fruit, 5%	1 serving	100
Milk (skimmed)	¾ glass	150

Reduction Diet for Expected or Ideal Weight of 120 lbs.

1,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 46, Protein 54, Fat 68, Calories 1,012

Food	*Gram Weight*	*Household Measure*
Cereal (dry)		
Bread		
Muffin (soybean)		
Butter	25	2½ squares
Salad dressing with oil		
Milk	300	1½ glasses
Cream, 20%	30	2 tablespoons
Cream, 40%		
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3%	300	4 small servings; 1½ cups
Vegetables, 6%		
Fruit, 5%	200	2 servings
Fruit, 10%	100	1 serving
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Reduction Diet for Expected or Ideal Weight of 120 lbs.

1,000 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	2 slices, crisp	10
Egg	1	50
Butter	½ square	5
Cream, 20%	2 tablespoons	30
Beverage—coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetables, 3%	2 small servings	150
Butter	1 square	10
Fruit, 5%	1 serving	100
Milk	¾ glass	150
DINNER		
Meat	1 serving	60
Vegetables, 3%	1 small serving	75
Salad: vegetable, 3%	1 small serving	75
Butter	1 square	10
Fruit, 5%	1 serving	100
Milk	¾ glass	150

Reduction Diet for Expected or Ideal Weight of 120 lbs.

1,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 46, Protein 54, Fat 90, Calories 1,210

Food	*Gram Weight*	*Household Measure*
Cereal (dry)		
Bread		
Butter	35	3½ squares
Salad dressing with oil	15	1 tablespoon
Milk	300	1½ glasses
Cream, 20%	30	2 tablespoons
Cream, 40%		
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3%	300	4 small servings; 1½ cups
Vegetables, 6%		
Fruit, 5%	200	2 servings
Fruit, 10%	100	1 serving
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Reduction Diet for Expected or Ideal Weight of 120 lbs.

1,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	2 slices, crisp	10
Egg	1	50
Butter	½ square	5
Cream, 20%	2 tablespoons	30
Beverage–coffee or tea		
LUNCHEON		
Meat	1 serving	60
Vegetables, 3%	2 small servings	150
Butter	1½ squares	15
Fruit, 5%	1 serving	100
Milk	¾ glass	150
DINNER		
Meat	1 serving	60
Vegetables, 3%	1 small serving	75
Salad:		
Fresh vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Butter	1½ squares	15
Fruit, 5%	1 serving	100
Milk	¾ glass	150

Reduction Diet for Expected or Ideal Weight of 160 lbs.

800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 61, Protein 73, Fat 30, Calories 802

Food	*Gram Weight*	*Household Measure*
Cereal (dry cooked)		
Bread	10	½ thin slice
Butter	3	¼ square
Salad dressing with oil		
Milk (skimmed)	400	2 glasses
Cream, 20%		
Cream, 40%		
Meat (lean)	90	1 large serving (3 oz.)
Meat (low in fat)*	90	1 large serving (3 oz.)
Egg whites	66	2
Egg	50	1
Vegetables, 3%	225	3 small servings (1⅛ cups)
Vegetables, 6%	75	1 small serving (½ cup, scant)
Fruit, 5%	100	1 serving
Fruit, 10%	200	2 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

* See page 204.

Reduction Diet for Expected or Ideal Weight of 160 lbs.

800 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Egg	1	50
Egg whites	2	66
Bread	½ thin slice	10
Butter	¼ square	3
Beverage—coffee or tea		
LUNCHEON		
Meat (low in fat)	1 large serving	90
Vegetables, 3%	2 small servings	150
Fruit, 5%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Meat (lean)	1 large serving	90
Vegetable, 6%	1 small serving	75
Salad: vegetable, 3%	1 small serving	75
Fruit, 10%	1 serving	100
Milk (skimmed)	1 glass	200

Reduction Diet for Expected or Ideal Weight of 160 lbs.

1,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 61, Protein 71, Fat 52, Calories 996

Food	*Gram Weight*	*Household Measure*
Cereal (dry)		
Bread	10	½ thin slice
Muffin (soybean)		
Butter	15	1½ squares
Salad dressing with oil		
Milk (skimmed)	400	2 glasses
Cream, 20%		
Cream, 40%		
Meat (lean)	180	2 large servings (6 oz.)
Bacon	5	1 slice, crisp
Egg	50	1
Vegetables, 3%	225	3 small servings (1⅛ cups)
Vegetables, 6%	75	1 small serving (½ cup, scant)
Fruit, 5%	100	1 serving
Fruit, 10%	200	2 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Reduction Diet for Expected or Ideal Weight of 160 lbs.

1,000 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	1 slice, crisp	5
Egg	1	50
Bread	½ thin slice	10
Butter	½ square	5
Beverage—coffee or tea		
LUNCHEON		
Meat	1 large serving	90
Vegetable, 3%	2 small servings	150
Butter	½ square	5
Fruit, 10%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Meat	1 large serving	90
Vegetable, 6%	1 small serving	75
Salad: vegetable, 3%	1 small serving	75
Butter	½ square	5
Fruit, 5%	1 serving	100
Milk (skimmed)	1 glass	200

Reduction Diet for Expected or Ideal Weight of 160 lbs.

1,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 62, Protein 71, Fat 76, Calories 1,216

Food	*Gram Weight*	*Household Measure*
Cereal (dry)		
Bread	10	½ thin slice
Muffin (soybean)		
Butter	40	4 squares
Salad dressing with oil		
Milk (skimmed)	400	2 glasses
Cream, 20%	15	1 tablespoon
Cream, 40%		
Meat (lean)	180	2 large servings (6 oz.)
Bacon	5	1 slice, crisp
Egg	50	1
Vegetables, 3%	225	3 small servings (1⅛ cups)
Vegetables, 6%	75	1 small serving (½ cup, scant)
Fruit, 5%	100	1 serving
Fruit, 10%	200	2 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Reduction Diet for Expected or Ideal Weight of 160 lbs.

1,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	1 slice, crisp	5
Egg	1	50
Bread	½ thin slice	10
Butter	1 square	10
Cream, 20%	1 tablespoon	15
Beverage—coffee or tea		
LUNCHEON		
Meat	1 large serving	90
Vegetables, 3%	2 small servings	150
Butter	1½ squares	15
Fruit, 10%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Meat	1 large serving	90
Vegetable, 6%	1 small serving	75
Salad: vegetable, 3%	1 small serving	75
Butter	1½ squares	15
Fruit, 5%	1 serving	100
Milk (skimmed)	1 glass	200

Reduction Diet for Expected or Ideal Weight of 200 lbs.

1,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 76, Protein 89, Fat 39, Calories 1,011

Food	*Gram Weight*	*Household Measure*
Cereal (dry)		
Bread	30	1½ thin slices
Butter		
Salad dressing with oil		
Milk (skimmed)	400	2 glasses
Cream, 20%		
Cream, 40%		
Meat (lean)	120	1 very large serving (4 oz.)
Meat (low in fat) *	120	1 very large serving (4 oz.)
Bacon	5	1 slice, crisp
Egg	100	2
Vegetables, 3%	300	3 servings
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%	100	1 serving
Fruit, 10%	200	2 servings
Vegetables and fruit, 20%		

* See page 204.

Reduction Diet for Expected or Ideal Weight of 200 lbs.

1,000 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	1 slice, crisp	5
Egg	2	100
Bread	½ thin slice	10
Beverage—coffee or tea		
LUNCHEON		
Meat (lean)	1 large serving	120
Vegetables, 3%	2 servings	200
Bread	½ thin slice	10
Fruit, 5%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Meat (low in fat)	1 large serving	120
Vegetable, 6%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	½ thin slice	10
Fruit, 10%	1 serving	100
Milk (skimmed)	1 glass	200

Reduction Diet for Expected or Ideal Weight of 200 lbs.

1,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 77, Protein 90, Fat 59, Calories 1,200

Food	*Gram Weight*	*Household Measure*
Cereal (dry)		
Bread	30	1½ thin slices
Muffin (soybean)		
Butter	5	½ square
Salad dressing with oil		
Milk (skimmed)	400	2 glasses
Cream, 20%	15	1 tablespoon
Cream, 40%		
Meat (lean)	240	2 very large servings (8 oz.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%	100	1 serving
Fruit, 10%	200	2 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Reduction Diet for Expected or Ideal Weight of 200 lbs.

1,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

BREAKFAST		Gm.
Fruit, 10%	1 serving	100
Bacon	2 slices, crisp	10
Egg	1	50
Bread	½ thin slice	10
Butter	½ square	5
Cream, 20%	1 tablespoon	15
Beverage–coffee or tea		
LUNCHEON		
Meat (lean)	1 very large serving	120
Vegetables, 3%	2 servings	200
Bread	½ thin slice	10
Fruit, 5%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Meat (lean)	1 very large serving	120
Vegetable, 6%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	½ thin slice	10
Fruit, 10%	1 serving	100
Milk (skimmed)	1 glass	200

Reduction Diet for Expected or Ideal Weight of 200 lbs.

1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 77, Protein 90, Fat 81, Calories 1,400

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	30	1½ thin slices
Butter	30	3 squares
Salad dressing with oil		
Milk (skimmed)	400	2 glasses
Cream, 20%	15	1 tablespoon
Cream, 40%		
Meat (lean)	240	2 very large servings (8 oz.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%	100	1 serving
Fruit, 10%	200	2 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

Reduction Diet for Expected or Ideal Weight of 200 lbs.

1,400 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	2 slices, crisp	10
Egg	1	50
Bread	½ thin slice	10
Butter	1 square	10
Cream, 20%	1 tablespoon	15
Beverage—coffee or tea		
LUNCHEON		
Meat (lean)	1 very large serving	120
Vegetable, 3%	2 servings	200
Bread	½ thin slice	10
Butter	1 square	10
Fruit, 5%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Meat (lean)	1 very large serving	120
Vegetable, 6%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	½ thin slice	10
Butter	1 square	10
Fruit, 10%	1 serving	100
Milk (skimmed)	1 glass	200

Reduction Diet for Expected or Ideal Weight of 200 lbs.

1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 112, Protein 100, Fat 62, Calories 1,393

Food	*Gram Weight*	*Household Measure*
Cereal (dry)		
Bread	60	3 thin slices
Butter	20	4 teaspoons
Salad dressing with oil		
Milk (skimmed)	400	2 glasses
Cream, 20%	20	4 teaspoons
Cream, 40%		
Meat (lean)	240	2 very large servings (8 oz.)
Egg	50	1
Vegetables, 3%	200	2 servings
Vegetables, 6%	200	2 servings
Fruit, 10%	200	2 servings
Fruit, 15%	100	1 serving

Reduction Diet for Expected or Ideal Weight of 200 lbs.

1,400 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 15%	1 serving	100
Egg	1	50
Bread	1 thin slice	20
Butter	2 teaspoons	10
Cream, 20%	4 teaspoons	20
Beverage—coffee or tea		
LUNCHEON		
Meat (lean)	1 very large serving	120
Vegetables, 3%	1 serving	100
Vegetables, 6%	1 serving	100
Bread	1 thin slice	20
Butter	1 teaspoon	5
Fruit, 10%	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Meat (lean)	1 very large serving	120
Vegetable, 6%	1 serving	100
Salad: vegetable, 3%	1 serving	100
Bread	1 thin slice	20
Butter	1 teaspoon	5
Fruit, 10%	1 serving	100
Milk (skimmed)	1 glass	200

Metabolic Diseases *(Continued)*

UNDERWEIGHT–EMACIATION

Nature of the Condition

Body weight varying degrees below normal

Object of Diet

Caloric intake above energy requirements

Underweight implies that the body weight of the individual is below the accepted average normal. It is a relative term including varying degrees, from the underweight individual who is in perfect health or the thin, undernourished individual who lacks endurance and resistance to those who are actually emaciated as the result of starvation or disease.

Important Factors in Dietary Treatment of Underweight–Emaciation

1. Calories: High
2. Protein: Moderate
3. Carbohydrate: High
4. Fat: Moderately high, easily digested
5. Bulk adapted to allow of concentrated food

These factors are now discussed briefly:

Calories: High. A high caloric intake must be given so as to supply energy considerably in excess of the body's requirements and to provide fuel for storage as fat. This may be accomplished by giving a diet that contains from at least 500 to 1,000 calories above the energy requirements. It is better to gain weight gradually than too rapidly. Adequate nourishment to raise the caloric intake may be given by liquid lunches between meals and at bedtime. This plan can be utilized when it does not upset digestion or spoil the appetite for regular meals. Many patients will prefer to eat larger meals and omit the liquid lunches between meals and at bedtime. The best foods to use for the between-meal feedings are milk, cream, eggs and fruit juices with lactose (milk sugar). One may make up various combinations, e.g., chocolate milk shakes, eggnog or beaten egg in fruit juice, and milk with one half cream. While a high caloric value is the main objective of the diet, care must be taken that it provides not only a fattening diet but an abundance of all the other nutritive essentials as well.

Protein: Moderate. Moderate amounts of protein of high biologic value, such as milk, eggs and meats, are used for tissue building and repair. The protein content should be easily digested and not given in excess, because protein tends to increase metabolism.

Carbohydrate: High. The carbohydrate content is naturally high, and should be chosen from such carbohydrate foods as cereal, breads, potatoes, honey, fruits, lactose and sugary foods.

Fats: Moderately High, Easily Digested. Fatty foods have a prominent place in the diet of the underweight person. It is easy to increase the energy intake by extra squares of butter and the liberal use of heavy cream, bacon, salad dressings and olive oil.

Bulk Should Be Adapted to Allow of Concentrated Food. Ample amounts of bulk from vegetables and fruits are needed to furnish adequate vitamins, minerals and needed residue. Care must be taken to adapt this bulk to the diet so as to allow enough concentrated food to furnish extra calories needed. The evidence is that there is need of an increased supply of mineral elements, especially calcium and phosphorus. Just how vitamins are used up or lost by the body in forms of marked underweight and starvation is not certain; however, an excess of vitamins in the diet may be a decided help.

GENERAL CONSIDERATIONS OF UNDERWEIGHT PROBLEMS

The so-called constitutionally obese person and the healthy person who is underweight may present extremes of the same problem. It is very important to study carefully the individual's daily program of life in an attempt to discover if he has any faulty food and health habits. It also must be ascertained whether any physical defects or disease are factors before one can hope to remedy the situation. If there is no gain in weight after carefully following the high caloric diet, there must be a recheck of the possible factors that may inhibit the individual from gaining weight. Gradually we are beginning to realize that we must take into consideration other factors in nutrition than the mere supply of food.

The body is not a machine and each individual reacts differently to the same amount of food eaten. The chief things to consider in estimating possible factors influencing underweight, apart from food habits, are the type of individual, physical defects, mental and social factors, overfatigue and faulty hygiene. If all these possibilities have been covered and advice is given with regard to the faults found, we are ready to prescribe the high caloric diet.

DIRECTIONS FOR APPLICATION OF DIETS

For simple cases of underweight, a few pounds can often be gained by adding some of the typical concentrated foods that are high in energy value. For underweight cases that need careful diet supervision, three diet procedures are outlined. These diets contain 70 Gm. of protein and 2,600, 3,000 and 3,600 calories. If a caloric intake higher than 3,600 calories is desired, this may be obtained by adding liquid refreshment between meals and at bedtime to the diets outlined. This refreshment may consist of milk, heavy cream, fruit juices and lactose.

Cases of emaciation, such as may arise in hyperthyroidism, often require as much as from 4,000 to 5,000 calories. In such cases the calories of the diets presented in this chapter should be increased by additional quantities of each food or by methods discussed on page 82. The diet that is to be used for the individual case depends upon the patient's ability to take food. It is better to start with a lower caloric intake and increase the diet than to start with a caloric content so high that the patient becomes discouraged before being able to adjust himself to a new regimen. Many individuals who are underweight have to begin treatment with a fear of and a distaste for food.

It is well to hospitalize certain cases for a few weeks in order to overcome the psychic element with regard to food. The patient must be disciplined to taking his food as he takes medicine, and no attention should be paid to his statements that he cannot eat this or that food. If he submits, the patient finds that he feels a little better if he gains a little weight, and progress is often continuous from this point. Exception is made only in the case of those few people who actually have a definite sensitization to certain foods, and fortunately they constitute a small percentage.

Typical foods to emphasize in treating underweight:

Milk
Cream
Butter and salad oils
Egg
Meat
Vegetables
Fruits and fruit juices
Sugar—lactose

High Caloric Diet

2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 250, Protein 70, Fat 145, Calories 2,585

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	200	1 glass
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings (1½ cups)
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	150	2 small servings (1¼ cups)
Sugar, jam or jelly	45	3 tablespoons
Dessert	100	1 serving

High Caloric Diet

2,600 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

BREAKFAST		*Gm.*
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Sugar	1 tablespoon	15
Jam or jelly	2 tablespoons	30
Cream, 20%	½ glass	100
Milk	½ glass	100
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Egg or egg substitute	1 serving	50
Potato or substitute	1 small serving	75
Vegetables	2 servings	200
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Cream, 20%	¼ glass	50
Milk	¾ glass	150
DINNER		
Meat	1 serving	60
Potato	1 small serving	75
Vegetable	1 serving	100
Fruit salad	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Dessert	1 serving	100
Cream, 20%	¼ glass	50
Milk	¾ glass	150

High Caloric Diet

3,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 290, Protein 70, Fat 175, Calories 3,015

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	200	1 glass
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings (1½ cups)
Fruit, 10% Fruit, 15%	300	3 servings
Fruit juice, 10%	400	2 glasses
Potato or substitute	150	2 small servings (1¼ cups)
Sugar, jam or jelly	45	3 tablespoons
Dessert	100	1 serving

High Caloric Diet

3,000 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Sugar	1 tablespoon	15
Jam or jelly	2 tablespoons	30
Cream, 20%	½ glass	100
Milk	½ glass	100
Beverage—coffee, tea or coffee substitute		
10 A.M. Fruit juice	1 glass	200
LUNCHEON		
Egg or egg substitute	1 serving	50
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Salad:		
Vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Cream, 20%	¼ glass	50
Milk	¾ glass	150
3 P.M. Fruit juice	1 glass	200
DINNER		
Meat	1 serving	60
Potato	1 small serving	75
Vegetable	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Dessert	1 serving	100
Cream, 20%	¼ glass	50
Milk	¾ glass	150

High Caloric Diet

3,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 350, Protein 70, Fat 215, Calories 3,615

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	95	9½ squares
Salad dressing with oil	45	3 tablespoons
Milk	400	2 glasses
Cream, 20%	200	1 glass
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit juice, 10%	600	3 glasses
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	200	2 servings
Sugar or lactose	60	4 tablespoons
Jam or jelly	15	1 tablespoon
Dessert	100	1 serving

High Caloric Diet

3,600 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Sugar	1 tablespoon	15
Jam or jelly	1 tablespoon	15
Cream, 20%	½ glass	100
Milk	½ glass	100
Beverage—coffee or tea		
10 A.M. Fruit juice	1 glass	200
Sugar or lactose	1 tablespoon	15
LUNCHEON		
Egg or egg substitute	1	50
Potato or substitute	1 serving	100
Vegetable	1 serving	100
Salad:		
Vegetable	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread	1 slice	30
Butter	4 squares	40
Fruit	1 serving	100
Cream, 20%	¼ glass	50
Milk	¾ glass	150
3 P.M. Fruit juice	1 glass	200
Sugar or lactose	1 tablespoon	15
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	3½ squares	35
Dessert	1 serving	100
Cream, 20%	¼ glass	50
Milk	¾ glass	150
8 P.M. Fruit juice	1 glass	200
Sugar or lactose	1 tablespoon	15

Nephritis

Nature of the Disease

Impairment of the ability of the kidneys to excrete waste products

Object of Diet

Adjustment of protein, salts and fluids to meet various types of impairment

Nephritis or its synonym Bright's disease may be defined as a diffuse, progressive, inflammatory, proliferative or degenerative lesion involving the renal parenchyma, the interstitial tissues or the renal vascular system. Many classifications of nephritis have been suggested. We are still unable to use a pathologic classification of nephritis that can be applied easily and accurately for clinical or dietetic purposes. Any attempt to go much beyond a few simple groups is apt to lead to confusion. Also, a classification too complex for use with the average patient is of very little use to the clinician.

It is difficult to make a general statement as to the proper diet in nephritis, because the diet needs considerable modification in the various types of nephritis.

The dietetic treatment of nephritis aims:

1. to spare the impaired kidney, to allow of recuperation;
2. to prevent uremia, the result of accumulation of waste products;
3. to prevent edema, tissue retention of water and salts;
4. to maintain nutrition—nephritis is essentially a wasting disease.

IMPORTANT FACTORS IN DIETARY TREATMENT OF NEPHRITIS

To accomplish these aims, the general important factors in dietary treatment of nephritis are:

1. Protein: Variable from low to high
2. Salt: Usually kept low
3. Water: Intake varies from marked restriction to normal amount
4. Calories: Adequate to maintain nutrition
5. Carbohydrate: High
6. Fat: Avoid excessive amounts
7. Alkaline-ash foods: Should predominate

These factors are now discussed briefly:

Protein: Variable from Low to High. It is possible that an excessively high protein proportion of the total caloric intake may have an adverse effect on the course of nephritis in man. This, however, should not be taken as an excuse for protein starvation. Kaufmann and McCann have shown no adverse effects from protein. Except during emergencies such as acute nephritis or chronic cases of nitrogen retention, the protein should not be lower than 1 Gm. per Kg. of normal body weight. In most chronic cases without complications in which the diet must be continued for a long period of time, amounts of protein from 60 to 75 Gm. will be adequate and proper. In acute conditions, the protein intake may have to be restricted to as low as 25 Gm. per day. In nephrosis, we use a higher amount of protein: as much as 150 Gm. per day. It should be emphasized that the best results from the protein allowance given to spare the impaired kidney can be obtained by the proper adjustment of the carbohydrate, the fat and the calories. Carbohydrate spares protein better than fat, and should be given in a liberal amount. A high fat content interferes with economical utilization of protein, and for protein economy the total caloric intake should not be excessive. It should also be emphasized that there is no great difference among the types of protein in red meats, white meats, poultry or other flesh proteins. The protein may be from meat, fish or fowl, as well as milk and its by-products and eggs.

Salt Content: Usually Low. The salt content of the diet is usually kept low on the assumption that salt retention is present in all forms of nephritis. As a result, salt is often restricted indiscriminately whenever albumin is found in the urine. While there is no absolute experimental proof that a diet low in salt is indicated in a nephritis that is not accompanied by edema, it is well to caution the patient not to use an excessive amount of salt, since the kidneys should be spared the extra effort involved in the output of added mineral elements. In acute and chronic nephritis with edema, salt restriction is necessary and a low salt diet is usually sufficient. A diet is considered low in salt if only a sparing amount of it is used in the preparation of food and no extra salt is used at the table, a normal amount being allowed in the bread and the butter. Such a diet contains approximately from 2 to 4 Gm. of salt daily. In some cases of acute or chronic nephritis with edema, it may be desirable or necessary to place the patient upon a salt-free diet. A salt-free diet is one in which all the food is prepared without salt, even the bread and the butter being salt-free, and no salt is added at table. Such a diet contains approximately 0.5 Gm. of salt daily.

One of the chief difficulties in administering a salt-free diet is often a loss of appetite due to the lack of taste and its influence on the flavor of foods. A large number of salt substitutes are on the market, few of them of distinct value. Potassium chloride and potassium nitrate may be used as a salt substitute and have the added advantage of acting as a diuretic. From 3 to 5 Gm. a day may be given. In all forms of nephritis the salt should be somewhat restricted, and when edema develops it should be limited to that contained in the food as it reaches the table. The stipulation of restriction beyond this is questionable.

Water: Intake Variable from Marked Restriction to Normal Amount. In most cases of chronic nephritis without complications, the ordinary amount of water intake may be continued indefinitely. When the kidneys show an inability to excrete water and the urine output is reduced, the water intake must be limited to an amount that will approximately balance the output of the kidney without the influence of diuretics. When diuretics are used, the fluid intake should be restricted, regardless of the output as influenced by diuretics.

Calories: Adequate to Maintain Nutrition. While the caloric intake of a nephritic patient should not be excessive, yet, because of the fact that nephritis is a wasting disease, the patient must be given a diet with an adequate amount of calories to maintain nutrition.

Carbohydrate: High. The carbohydrate content of the diet should be high, primarily because its protein-sparing properties are more efficient than fat. Where there is a tendency to nausea, it is more likely to be better tolerated than fat. There is added need of carbohydrate in impending uremia with acidosis.

Fat: Excessive Amounts Are to Be Avoided. This so that a more economical use of protein may be permitted. In the nephrosis syndrome with the blood plasma low in protein and high in lipoid content, it is necessary to have a diet poor in fat.

Alkaline-ash Foods: Should Predominate. While a few cases may respond to a neutral-ash type of diet, the majority will lean toward basic formation. An acid-ash type of diet may tend to aggravate an impaired kidney and add to its already poor function.

The foregoing discussion of important factors applies in general to nephritis. Six simple groups of cases will be discussed in order to give directions for the application of the diet in nephritis. These are:

1. Chronic nephritis without complications
2. Acute nephritis
3. Chronic nephritis with edema
4. Nephrosis
5. Renal arteriosclerosis
6. Uremia

CHRONIC NEPHRITIS WITHOUT COMPLICATIONS

Chronic nephritis without complications and of moderate severity has no dominating symptoms and is a disease ordinarily of long duration. This means that the patient must adapt himself to living for years on a so-called nephritic diet. Often the renal lesion is evidenced only by the finding of albumin in the urine and is discovered accidentally during a routine physical examination or on applying for life insurance. Symptoms, in fact, may be so negligible, even in cases in which the renal function is already markedly defective, that chronic nephritis of this type may not be recognized until impending uremia develops. The most frequent associated physical finding, if any, is an increased blood pressure.

There is a radical difference of opinion between the past and the present on the conception of the proper diet for nephritis. In the past, thought was focused primarily upon the kidney and the possible damage of protein end products of catabolism. As a result, the patient was told to eat no meat. Recently the trend of thought has been toward the patient himself and the upbuilding effects of protein with greater allowance of protein.

Experiments show both that the rigid dietary restriction of protein is well borne and that it is conducive to premature deterioration and actually is contraindicated. Carefully controlled clinical experiments are needed of the renal function of patients on various diets and varying fluid and salt intakes over long periods of time. Practically all our information is based on short-time observations. This results in more or less individualizing our advice in this group of cases and it must be modified to meet each case.

IMPORTANT FACTORS IN DIETARY TREATMENT

Important factors in dietary treatment of chronic nephritis without complications are:

1. Protein: Essentially normal
2. Fluid intake: Essentially normal
3. Salt: Somewhat restricted
4. Carbohydrate: High
5. Fat: Avoid excess
6. Calories: Adequate (but overeating should be avoided)
7. Alcohol: Strictly forbidden

This outline demonstrates that, with a few exceptions, it is essentially a normal diet. While it is not stressed that salt be restricted, it should not be used excessively.

It is imperative that alcohol be cut out entirely and that the habit of overeating, if it exists, be overcome. Fried foods, rich proteins and heavy desserts should very definitely be limited. Tea and coffee, while best omitted, may be allowed occasionally. The obese patient with chronic nephritis with or without complications should be encouraged to reduce gradually to his ideal weight.

DIRECTIONS FOR APPLICATION OF DIETS

With the above factors in mind the diet for chronic nephritis without complications is presented in two series, one series containing 60 Gm. of protein, the other 70 Gm. of protein. The calories in each series vary from 1,800 to 2,600. Should a protein intake lower than 60 Gm. be desired, one of the three 50-Gm. protein diets ranging from 1,800 to 2,600 calories outlined on pages 268 to 273 may be selected. These diets may be used in he late stages of recovery from acute nephritis or in chronic nephritis without omplications. If a higher protein intake s needed, one of the diets outlined for ephrosis with protein from 80 to 150 Gm. on pages 290 to 295 may be selected.

The selection of the amount of protein or calories will depend upon the ideal weight and the individual needs of the case at hand. The protein content of any of the diets may be increased or decreased by the addition or subtraction of protein foods. For example, 1 egg furnishes 6 Gm. of protein and 6 Gm. of fat; 20 Gm., or a 1-inch cube, of solid cheese furnish 6 Gm. of protein and 7 Gm. of fat; 45 Gm. of meat, or 1½ oz., furnish 11 Gm. of protein and 7 Gm. of fat.

The caloric content in this series may be increased or decreased without having any essential bearing on the protein content by adding to or subtracting from the diet a part of the carbohydrate or fat, or both. For example:

One teaspoon (5 Gm.) sugar or jelly or jam is approximately 20 calories.
One glass of 10 per cent fruit juice is approximately 80 calories.
One square (10 Gm.) of butter is approximately 75 calories.
One tablespoon (15 Gm.) of salad dressing made with oil is about 115 calories.

Canned fruits may be used in any of these diets since they increase only slightly the carbohydrate and the calories. In many instances the patient will prefer the canned fruit with sugar in order to omit a part or all of the sugar, jelly or jam calculated in the diet.

The approximate average water and mineral content expressed in grams of all diets containing 60 and 70 Gm. of protein are:

Water	1385.
Sodium	1.586
Potassium	3.296
Calcium	.972
Magnesium	.353
Chlorine	2.202
Phosphorus	1.188
Iron	.0145
Sulfur	.945

Suggested substitutions permissible in all nephritic diets are outlined below.

SUBSTITUTIONS

The following substitutions have been planned so that the protein, the calories, the minerals and the vitamins are not appreciably changed.

The carbohydrate and the fat vary proportionately to the amount of fat substituted for pure carbohydrates or the amount of pure carbohydrate substituted for fats, as one tablespoonful of salad dressing made with oil contains approximately no carbohydrate, 13 Gm. fat and 120 calories, while 2 tablespoonfuls of sugar contain approximately 30 Gm. carbohydrate, no fat and 120 calories.

A Few Suggested Substitutions

In place of one slice of bread, substitute one of the following:

Potato, 1 small serving	(75 Gm.)
Macaroni, 1 small serving	(75 Gm.)
Cereal, one serving	(140 Gm., cooked)

In place of one egg, substitute one of the following:

Meat, chicken or fish	1 very small serving (1 oz.)
Solid cheese	1 one-inch cube
Cottage cheese	2 tablespoons
Milk*	1 glass

In place of one tablespoon of salad dressing made with oil, substitute one of the following:

1½ squares of butter
1½ glass of 10 per cent fruit juice
3 small pieces of candy
2 tablespoons jelly or jam
2 tablespoons sugar

METHOD OF CALCULATING THE MINERAL CONTENT OF DIETS

The approximate average mineral content of the nephritic diets, as well as all other diets presented in this book, has been determined by finding the average mineral content of the various groups of food materials. For example, when a diet calls for 300 Gm. of 3 per cent vegetables, the mineral content is calculated by determining the average mineral content of the most commonly used vegetables selected from the 3 per cent group. Where 6 per cent vegetables are used, an average has been made of the most commonly used vegetables from the 6 per cent group. Fruits, cereals, meats and other food materials were calculated in this same manner, an average mineral content for each group being used.

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* The diets for chronic nephritis with edema were planned without milk in order to keep the fluid content as low as possible.

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 210, Protein 60, Fat 80, Calories 1,800

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	25	2½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	75	1 serving (2½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	150	2 small servings
Sugar	10	2 teaspoons
Dessert	100	1 serving

60 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread	1 slice	30
Butter	½ square	5
Cream, 20%	¼ cup	60
Sugar	2 teaspoons	10
Beverage—coffee substitute		
LUNCHEON		
Potato or substitute	1 small serving	75
Vegetables	2 servings	200
Bread	1 slice	30
Butter	1 square	10
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	75
Potato	1 small serving	75
Vegetable	1 serving	100
Fruit salad	1 serving	100
Bread	1 slice	30
Butter	1 square	10
Dessert	1 serving	100
Milk	1 glass	200

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 250, Protein 60, Fat 105, Calories 2,185

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	55	5½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	75	1 serving (2½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Fruit juice, 10%	200	1 glass
Potato or substitute	150	2 small servings
Sugar	30	2 tablespoons
Dessert	100	1 serving

60 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Sugar	2 tablespoons	30
Beverage—coffee substitute		
LUNCHEON		
Fruit juice cocktail	1 glass	200
Potato or substitute	1 small serving	75
Vegetables	2 servings	200
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	75
Potato	1 serving	75
Vegetable	1 serving	100
Fruit salad	1 serving	100
Bread	1 slice	30
Butter	2½ squares	25
Dessert	1 serving	100
Milk	1 glass	200

60 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 290, Protein 60, Fat 135, Calories 2,615

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	75	1 serving (2½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Fruit juice, 10%	600	3 glasses
Potato or substitute	150	2 small servings
Sugar	30	2 tablespoons
Dessert	100	1 serving

60 Gm. Protein
2,600 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
	BREAKFAST	
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	2 tablespoons	30
Beverage—coffee substitute		
10 A.M. Fruit juice	1 glass	200
	LUNCHEON	
Fruit juice cocktail	1 glass	200
Potato or substitute	1 small serving	75
Vegetable, 3 or 6%	1 serving	100
Salad:		
Vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
3 P.M. Fruit juice	1 glass	200
	DINNER	
Meat	1 serving	75
Potato	1 small serving	75
Vegetable	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Dessert	1 serving	100
Milk	1 glass	200

70 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 200, Protein 70, Fat 80, Calories 1,800

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	15	1½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	90	2 small servings (3 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	150	2 small servings
Dessert	100	1 serving

70 Gm. Protein
1,800 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread (toast)	1 slice	30
Butter	½ square	5
Cream, 20%	¼ cup	60
Beverage–coffee substitute		
LUNCHEON		
Meat	1 small serving	45
Potato or substitute	1 small serving	75
Vegetables	2 servings	200
Bread	1 slice	30
Butter	½ square	5
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 small serving	45
Potato	1 small serving	75
Vegetable	1 serving	100
Fruit salad	1 serving	100
Bread	1 slice	30
Butter	½ square	5
Dessert	1 serving	100
Milk	1 glass	200

70 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 240, Protein 70, Fat 105, Calories 2,185

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	45	4½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	90	2 small servings (3 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	150	2 small servings
Sugar and jam	45	3 tablespoons
Dessert	100	1 serving

70 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
	BREAKFAST	
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread (toast)	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Jam	2 tablespoons	30
Sugar	1 tablespoon	15
Beverage—coffee substitute		
	LUNCHEON	
Meat	1 small serving	45
Potato or substitute	1 small serving	75
Vegetables	2 servings	200
Bread	1 slice	30
Butter	1½ squares	15
Fruit	1 serving	100
Milk	1 glass	200
	DINNER	
Meat	1 small serving	45
Potato	1 small serving	75
Vegetable	1 serving	100
Fruit salad	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Dessert	1 serving	100
Milk	1 glass	200

70 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 280, Protein 70, Fat 135, Calories 2,615

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	50	5 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	90	2 small servings (3 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Fruit juice, 10%	400	2 glasses
Potato or substitute	150	2 small servings
Sugar and jam	45	3 tablespoons
Dessert	100	1 serving

70 Gm. Protein
2,600 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

BREAKFAST		
		Gm.
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread (toast)	1 slice	30
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Jelly or jam	2 tablespoons	30
Sugar	1 tablespoon	15
Beverage—coffee substitute		
10 A.M. Fruit juice	1 glass	200
LUNCHEON		
Meat	1 small serving	45
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Salad:		
Vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	1½ squares	15
Fruit	1 serving	100
Milk	1 glass	200
3 P.M. Fruit juice	1 glass	200
DINNER		
Meat	1 small serving	45
Potato	1 small serving	75
Vegetable	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Dessert	1 serving	100
Milk	1 glass	200

ACUTE NEPHRITIS

Acute nephritis usually is a disease of comparatively short duration. Generally it follows one of the upper respiratory infections, an acute contagious disease of childhood or an attack of scarlet fever, diphtheria, pneumonia or typhoid fever experienced at any time of life. Acute nephritis is more common in children and in young adults than in those of middle or old age.

Because of the shorter duration of the disease, the patient's nutritive requirements are of less importance than in chronic nephritis. In the acute, severe forms of nephritis in which nausea and vomiting are predominant symptoms, it is well to withhold any food for 1 or 2 days. Starvation for a few days does no harm.

The most frequent symptom noted by the patient is edema, which varies greatly in extent, from simple transient edema to general anasarca. Urine excretion is generally much diminished in amount and contains albumin, casts, much blood and a few leukocytes. Headache, nausea and vomiting may also be present.

IMPORTANT FACTORS IN DIETARY TREATMENT

Important dietary factors in the treatment of acute nephritis are:

1. Protein: Marked restriction
2. Fluids: Sufficient for proper drainage, but not forced
3. Salt: Low
4. Calories: Restricted to minimum
5. Carbohydrate: High
6. Fat: Low

To this outline of important factors should be added the importance of rest in bed. Volhard has had very good results with a so-called hunger treatment. The Karell milk diet is often used during acute stages, fruit juice with sugar being added if more calories are needed. For the first few days in acute nephritis it is well to restrict protein to 20 or 25 Gm. and the total calories to a minimum. Later, the protein may be increased to 30 or 40 Gm. More starchy foods are added but the protein is limited for a long period, although not too prolonged, especially if plasma proteins are low.

When there is anuria, the fluids should be limited to small quantities of water by mouth or crushed ice. Fluids should be limited at first to about 1,000 cc. daily. If vomiting and edema occur, it may be necessary to restrict them still more. Later the amount may be increased gradually to 1,500 cc. daily. As the output increases, the intake may be increased.

DIRECTIONS FOR APPLICATION OF DIETS

The dietary for acute nephritis is presented in a series of increasing amounts of protein from 25 to 50 Gm. and from 1,800 to 2,600 calories. In acute nephritis, the first step in treatment is to use the 25-Gm. protein diet. If, as occasionally occurs, the patient is nauseated, vomiting and unable to follow the 25-Gm. protein diet, fruit juices and sugar only may be used, or possibly the Karell diet (p. 414) will be tolerated best. For at least 4 weeks the food should be primarily carbohydrate with small amounts of fat. The protein can be increased to from 30 to 40 Gm. after the first week or 10 days, depending upon the reaction and type of patient. The basal caloric needs can be approximated at this time also.

After the first month, if the patient continues to improve, the protein quota can be increased to 50 Gm. In the later stages of recovery from acute nephritis the diets suggested for chronic nephritis without complications may be used. No salt should be added to the patient's food after it comes to the table in any of the diets listed under acute nephritis. These diets are low in salt and contain from 2 to 4 Gm. daily. In some cases of acute nephritis with edema it may be desirable to place the patient upon a salt-free diet, and in this case the food must be prepared without salt, even the bread and the butter being salt-free with no salt added at table. This will allow approximately 0.5 Gm. of salt daily.

After the severity of the acute phase has passed, there is a transitional stage in which the kidney lesion may heal completely or may progress into clinical nephritis. The importance of diet regulation during this period has not been sufficiently emphasized. A patient may consider himself cured when the kidney lesion is really latent and may fail to restrict his diet and exercise until chronic nephritis has developed. The belief is becoming more widespread that most cases of chronic nephritis develop from acute cases that have gone undiagnosed, untreated and unhealed.

The approximate average mineral content, expressed in grams, of the diets for acute nephritis are:

25 Gm. protein:

Water	1890.
Sodium	0.877
Potassium	3.413
Calcium	1.038
Magnesium	0.260
Chloride	1.357
Phosphorus	0.742
Sulfur	0.451
Iron	0.0062

30 Gm. protein:

Water	1983.
Sodium	1.043
Potassium	3.587
Calcium	1.176
Magnesium	0.285
Chloride	1.684
Phosphorus	0.881
Sulfur	0.510
Iron	0.0068

40 Gm. protein:

Water	1181.
Sodium	1.152
Potassium	2.779
Calcium	0.556
Magnesium	0.238
Chloride	0.998
Phosphorus	0.888
Sulfur	0.686
Iron	0.0120

50 Gm. protein:

Water	1256.
Sodium	1.206
Potassium	2.989
Calcium	0.864
Magnesium	0.261
Chloride	1.766
Phosphorus	1.116
Sulfur	0.743
Iron	0.0122

FACTORS IN KIDNEY EXCRETION

Water is by far the largest in quantity of the waste products excreted in the urine. When an unusual loss of water through the skin takes place, as in hot weather, the amount excreted by the kidneys is correspondingly less. The next most important constituents of urine are the nitrogenous end products of protein metabolism. Urea alone makes up about half the total solids of the urine and constitutes the form in which from 80 to 90 per cent of the nitrogen from metabolized protein is excreted. Smaller amounts of uric acid, creatinine and ammonium salts are other nitrogen-containing constituents of urine. While they are not toxic in the amounts ordinarily present in the blood, if the kidneys fail to do their work in excreting them, they accumulate in the blood to a certain level, and toxic symptoms set in.

Several kinds of mineral salts are excreted by the kidneys. Sodium chloride is excreted solely in the urine and its source is the salt eaten in the food. Phosphates and sulfates come chiefly from the metabolism of the proteins which contain phosphorus and sulfur. Other salts are largely those ingested in the food. When the kidneys fail to function well, salts may accumulate in the blood and the tissues, holding back sufficient water to dilute them to their normal concentration in the tissues and so causing edema.

The extent to which the amount of blood sent through the kidney influences the secretion of urine is often unappreciated. Naturally a larger volume of urine is secreted when a great deal of blood is shunted through the renal circulation than when the kidneys are less richly supplied with blood. This accounts for the increased flow of urine under conditions of nervous stimulation.

Diuretics are substances which exert a stimulating effect on the kidneys. Coffee and tea both stimulate the kidneys to increased secretion of urine and are the only diuretics in common use except water, which is an excellent diuretic. It is very generally recognized that drinking large amounts of water results in the secretion of a much increased volume of urine, but the amount of pigment and waste products excreted remains the same, the extra water merely rendering the urine more dilute. Alcohol and pepper are both kidney irritants.

25 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 260, Protein 25, Fat 74, Calories 1,806

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	30	3 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	150	¾ glass; ⅝ cup
Cream, 40%		
Meat (lean)		
Bacon		
Egg		
Vegetables, 3%, 6%, 15% puréed	90	about ½ cup
Fruit, 5%		
Fruit juice, 10%	1200	6 glasses
Sugar or lactose	60	4 tablespoons

25 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD
ALLOWANCE FOR ONE DAY

BREAKFAST		*Gm.*
Fruit juice	1 glass	200
Cereal	⅔ cup	140
Bread (toast)	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
10 A.M. Fruit juice	1 glass	200
Sugar or lactose	1 tablespoon	15
LUNCHEON		
Milk toast:		
Milk	1 glass	200
Toast	1 thin slice	20
Butter	1 square	10
Fruit juice	1 glass	200
2 P.M. Fruit juice	1 glass	200
Sugar or lactose	1 tablespoon	15
4 P.M. Fruit juice	1 glass	200
Sugar or lactose	1 tablespoon	15
DINNER		
Cream of vegetable purée:		
Cream, 20%	⅜ cup	90
Vegetable purée	about ½ cup	90
Toast	1 thin slice	20
Butter	1 square	10
Fruit juice	1 glass	200
8 P.M. Milk	1 glass	200

30 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 345, Protein 30, Fat 80, Calories 2,220

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	30	3 squares
Salad dressing with oil		
Milk	500	2½ glasses; 1 pint
Cream, 20%	150	¾ glass; ⅝ cup
Cream, 40%		
Meat (lean)		
Bacon		
Egg		
Vegetables, 3%, 6%, 15% puréed	90	⅜ cup
Fruit, 5%		
Fruit juice, 10%	1200	6 glasses
Hard candy	30	3–4 small pieces
Sugar or lactose	100	½ cup

30 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

			Gm.
	BREAKFAST		
	Fruit juice	1 glass	200
	Cereal (cooked)	⅔ cup	140
	Bread (toast)	1 slice	30
	Butter	1 square	10
	Cream	¼ cup	60
	Sugar	2 tablespoons	30
10 A.M.	Fruit juice	1 glass	200
	Sugar or lactose	1 large tablespoon	20
	LUNCHEON		
	Milk toast:		
	Toast	1 slice	30
	Milk	1 glass	200
	Butter	1 square	10
	Fruit juice	1 glass	200
	Sugar or lactose	1 tablespoon	15
2 P.M.	Fruit juice	1 glass	200
	Candy	3–4 small pieces	30
4 P.M.	Fruit juice	1 glass	200
	Sugar or lactose	1 large tablespoon	20
	DINNER		
	Cream of vegetable purée:		
	Cream	⅜ cup	90
	Vegetable purée	about ½ cup	90
	Toast	1 slice	30
	Butter	1 square	10
	Fruit juice	1 glass	200
	Sugar or lactose	1 tablespoon	15
	Milk	½ glass	100
8 P.M.	Milk	1 glass	200

40 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 210, Protein 40, Fat 90, Calories 1,810

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	65	6½ squares
Salad dressing with oil		
Milk	150	¾ glass
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	4 small servings (1½ cups)
Fruit juice, 10%	200	1 glass
Fruit, 10%–15%	300	3 servings
Potato or substitute	200	2 servings; 1 cup
Jelly and sugar	45	3 tablespoons

40 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
	BREAKFAST	
Fruit juice	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jelly	2 tablespoons	30
Beverage—coffee substitute		
	LUNCHEON	
Potato or substitute	1 serving	100
Vegetable	2 small servings	150
Bread	1 thin slice	20
Butter	2½ squares	25
Fruit	1 serving	100
Milk	¾ glass	150
	DINNER	
Meat	1 small serving	45
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	75
Vegetable salad	1 serving	75
Bread	1 thin slice	20
Butter	2½ squares	25
Fruit	1 serving	100
Fruit juice, 10%	1 glass	200

40 Gm. Protein
2,200 Calories

Quantitative and Estimated Quantitative
Total Food Allowance for One Day

Carbohydrate 250, Protein 40, Fat 115, Calories 2,195

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	65	6½ squares
Salad dressing with oil	30	2 tablespoons
Milk	150	¾ glass
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	4 small servings (1½ cups)
Fruit juice, 10%	200	1 glass
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	200	2 servings (1 cup)
Jelly and sugar	90	6 tablespoons

40 Gm. Protein
2,200 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jelly or jam	2 tablespoons	30
Beverage—coffee substitute		
LUNCHEON		
Potato or substitute	1 serving	100
Vegetable	1 small serving	75
Salad:		
Vegetable	1 serving	75
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	2½ squares	25
Fruit	1 serving	100
Milk	¾ glass	150
Jam	1 tablespoon	15
DINNER		
Meat	1 small serving	45
Potato or substitute	1 serving	100
Vegetable	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	2½ squares	25
Jam	2 tablespoons	30
Fruit	1 serving	100
Fruit juice, 10%	1 glass	200

40 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 295, Protein 40, Fat 140, Calories 2,600

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	95	9½ squares
Salad dressing with oil	30	2 tablespoons
Milk	150	¾ glass
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	4 small servings
Fruit, 10% Fruit, 15%	300	3 servings
Fruit juice, 10%	600	3 glasses
Potato or substitute	200	2 servings
Jelly or sugar	90	6 tablespoons

40 Gm. Protein
2,600 Calories

Suggested Distribution of the Total Food Allowance for One Day

BREAKFAST

		Gm.
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	2 squares	20
Cream, 20%	¼ cup	60
Jelly or jam	2 tablespoons	30
Sugar	1 tablespoon	15
Beverage—coffee substitute		
10 A.M. Fruit juice	1 glass	200

LUNCHEON

Potato or substitute	1 serving	100
Vegetable	1 small serving	75
Salad:		
Vegetable	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	3½ squares	35
Fruit	1 serving	100
Milk	¾ glass	150
Jelly or jam	2 tablespoons	30
3 P.M. Fruit juice	1 glass	200

DINNER

Meat	1 small serving	45
Potato or substitute	1 serving	100
Vegetable	1 small serving	75
Salad:		
Vegetable	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	4 squares	40
Fruit	1 serving	100
Fruit juice	1 glass	200
Jelly or jam	1 tablespoon	15

50 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 210, Protein 50, Fat 85, Calories 1,805

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	35	3½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	150	2 small servings
Jelly, sugar or jam	30	2 tablespoons
Dessert	100	1 serving

50 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Sugar	2 tablespoons	30
Beverage—coffee substitute		
LUNCHEON		
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Vegetable salad	1 serving	100
Bread	1 thin slice	20
Butter	1 square	10
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 small serving	45
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Fruit salad	1 serving	100
Bread	1 thin slice	20
Butter	1½ squares	15
Dessert	1 serving	100
Milk	1 glass	200

50 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 260, Protein 50, Fat 105, Calories 2,185

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	60	6 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Fruit juice, 10%	200	1 glass
Potato or substitute	150	2 small servings
Jelly and sugar	60	4 tablespoons
Dessert	100	1 serving

50 Gm. Protein
2,200 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jelly or jam	2 tablespoons	30
Beverage—coffee substitute		
LUNCHEON		
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Vegetable salad	1 serving	100
Bread	1 thin slice	20
Butter	2 squares	20
Jelly or jam	1 tablespoon	15
Fruit	1 serving	100
Milk	1 glass	200
3 P.M. Fruit juice	1 glass	200
DINNER		
Meat	1 small serving	45
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Fruit salad	1 serving	100
Bread	1 thin slice	20
Butter	2 squares	20
Dessert	1 serving	100
Milk	1 glass	200

50 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 300, Protein 50, Fat 135, Calories 2,615

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	65	6½ squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	45	1 small serving (1½ oz.
Bacon		
Egg	50	1
Vegetables, 3%	300	3 servings
Vegetables, 6%		
Fruit, 10%	300	3 servings
Fruit, 15%		
Fruit juice, 10%	600	3 glasses
Potato or substitute	150	2 small servings
Jelly and sugar	60	4 tablespoons
Dessert	100	1 serving

50 Gm. Protein
2,600 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jelly or jam	2 tablespoons	30
Beverage—coffee substitute		
10 A.M. Fruit juice	1 glass	200
LUNCHEON		
Fruit juice cocktail	1 glass	200
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Salad:		
Vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	2½ squares	25
Jelly or jam	1 tablespoon	15
Fruit	1 serving	100
Milk	1 glass	200
3 P.M. Fruit juice	1 glass	200
DINNER		
Meat	1 small serving	45
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 thin slice	20
Butter	2½ squares	25
Dessert	1 serving	100
Milk	1 glass	200

CHRONIC NEPHRITIS WITH EDEMA

The most prominent symptom and physical finding in this group of cases is edema. The blood pressure in chronic nephritis with edema is almost always increased at some stage of the disease. The urine is decreased in amount and poor in sodium chloride; thus water and salt are retained. The urine contains a great deal of albumin and many casts of different types. Peters finds a serum-protein deficiency. The albumin in the blood plasma is decreased and the globulin relatively increased. There is no increase in the nonprotein nitrogenous bodies in the blood in the earlier stages, there is a moderate increase throughout the general course of the disease and a marked increase at the end. Uremia is a much more frequent development in such cases than in those without edema. Kahn fails to find this change. The concentration of the plasma proteins should be studied more often than has been done. The reduction of the plasma proteins seems to be an index of protein starvation and, although it can develop without albuminuria, this is commonly present in high grade.

The important practical contributions of Munk, Volhard, Farr, Epstein and others have been to place emphasis upon the need of liberalizing the diet for renal cases. The diet should be liberal in protein to replace the loss of albumin from the blood, providing the renal function is such that it will permit of its utilization without retention of nonprotein nitrogen.

The diagnosis of chronic nephritis with edema is not always simple. Not all cases of edema and albuminuria are nephritic, since there is also an edema of cardiovascular origin. A good method of differentiating these two conditions is to give the patient digitalis or diuretin, either of which will usually produce diuresis if the edema is of cardiac origin. If a true nephritis is responsible for the edema, a diuresis is unlikely.

The prognosis of this group is rather bad, generally from 3 to 5 years, and the dietary regimen must be followed continuously.

IMPORTANT FACTORS IN DIETARY TREATMENT

Important factors in the dietary treatment of chronic nephritis with edema are:

1. Protein: To be decided in each case
2. Fluids: Marked restriction
3. Salt: Rigorous restriction
4. Carbohydrate: High
5. Fat: No excess

The chief factors in the diet management of this group are that fluids and salt elements be restricted and enough protein given to meet the individual's need, this depending upon the nitrogen metabolism and the level of serum protein. The total fluid intake for the adult should be limited, as a rule, from 700 to 1,000 cc. daily. The usual salt content is restricted from 0.5 Gm. to about 2 Gm. daily. The average case is started on a 40-Gm. protein diet. The presence or absence of nitrogen retention or low serum protein determines the question as to the amount of protein increase that may be allowed.

Keith and his coworkers at the Mayo Clinic have reported good results from the use of low ionic diets. They have stressed the fact that both the water and the salt content of the food should be under exact control. This diet is kept the same from day to day. Although the patient is under a constant regime, which allows for better study, it has the disadvantage of monotony and it may be impossible to force the patient to take it. We find that there is very little difference in the mineral content between the low ionic diets advocated by Keith, which necessitate the use of identically the same foods every day, and the salt-free diets we have outlined below, which allow of a more liberal choice of foods, especially the fruits and the vegetables. The water content in our salt-free diets is slightly higher than that in the ionic diet.

Directions for Application of Diets

Four salt-free diets are presented. They contain 40 Gm. of protein with 1,500 calories, and 50, 60 and 70 Gm. of protein with 2,000 and 2,200 calories. In order to keep the fluid and the salt content of these salt-free diets constant, the calories should be increased or decreased by adding to or subtracting from the procedures outlined only fats (such as butter and salad dressing) or sweets (such as sugar, jelly, jams or candy). In preparing and serving food, no salt of course is added, and the bread and the butter are salt-free. These diets contain approximately 1,100 cc. of fluid, which constitutes the water content of the food.

The patient in following the salt-free diets should start with the 40-Gm. protein diet with 1,500 calories. As soon as the individual metabolic needs and ability to take care of protein are determined, the protein and the calories may be increased.

In certain cases the best results in controlling the edema may be obtained only by continuing the salt-free diet indefinitely. In other cases, the diets outlined for chronic nephritis without complications (pp. 242 to 253) may be used, except that they should be salt-free, or perhaps low in salt, if no edema develops. Any one of the diets for chronic nephritis without complications may be made salt-free by simply eliminating all the salt in the preparation of food, using salt-free bread and butter and avoiding the use of table salt. The fluid content of the food may be kept low by substituting 1 egg or a small piece of meat (1 oz.) for each glass (200 cc.) of milk in the diet. Of course, any additional fluid to that in the diet taken by mouth must be restricted to between 500 and 1,000 cc.

The approximate average water and mineral content, expressed in grams, of the salt-free diets for chronic nephritis with edema are:

Water	1085.
Sodium	0.595
Potassium	2.773
Calcium	0.433
Magnesium	0.254
Chloride	0.696
Phosphorus	0.870
Sulfur	0.682
Iron	0.0135

FACTORS INFLUENCING THE DEVELOPMENT OF ANEMIA IN NEPHRITIS

In every case of chronic nephritis, a secondary anemia is likely to develop at any time. The toxic influence that produces the anemia is not yet known, but experiments in animals have shown that when as much as three fourths of the kidney is removed, death from asthenia results in from 1 to 6 months. If a diet too low in protein is used over a long period of time in the treatment of nephritis, secondary anemia will develop at a much earlier stage of the disease than if a diet adequate or high in protein were used. On a low protein intake the patients are prematurely invalided and may die before retention uremia develops. On an adequate protein intake the anemia develops more slowly, the vitality of the patient is maintained a longer time and death will usually result from the inevitable retention uremia.

Not only has it been shown that a high protein diet will delay the development of anemia but there is evidence that a high protein intake does not hasten the pathologic changes in the kidneys. It is likely that a deficient protein intake will hasten the progression of the kidney lesion.

The protein intake is one of the most important factors in the treatment of chronic nephritis in order to delay the onset of anemia. The malnutrition of a low protein intake not only influences the development of secondary anemia but it makes the patient more susceptible to infectious diseases.

Salt-free Diet

40 Gm. Protein
1,500 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 160, Protein 40, Fat 80, Calories 1,520

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	55	5½ squares
Salad dressing with oil		
Milk		
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	45	1 serving (1½ oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute	150	2 small servings
Sugar, jelly or jam	20	4 teaspoons

Salt-free Diet

40 Gm. Protein
1,500 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
	BREAKFAST	
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread	1 thin slice	20
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Sugar	1 teaspoon	5
Jelly or jam	1 tablespoon	15
	LUNCHEON	
Egg or egg substitute	1	50
Potato or substitute	1 serving (small)	75
Vegetable, 3%	1 serving	100
Bread	1 thin slice	20
Butter	2 squares	20
Fruit	1 serving	100
	DINNER	
Meat	1 serving	45
Potato or substitute	1 small serving	75
Vegetable, 3%	2 servings	200
Bread	1 thin slice	20
Butter	2 squares	20
Fruit	1 serving	100

Salt-free Diet

50 Gm. Protein
2,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 195, Protein 50, Fat 115, Calories 2,015

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	30	2 tablespoons
Milk		
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	400	4 servings
Potato or substitute	200	2 servings
Sugar and jam	30	2 tablespoons

Salt-free Diet

50 Gm. Protein
2,000 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jam	1 tablespoon	15
LUNCHEON		
Egg or egg substitute	1	50
Potato or substitute	1 serving	100
Vegetable	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Fruit, 10%	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 3% or 6%	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit, 10%	1 serving	100

Salt-free Diet

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 220, Protein 60, Fat 120, Calories 2,200

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	30	2 tablespoons
Milk		
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	105	2 servings (3½ oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	400	4 servings
Potato or substitute	200	2 servings
Sugar and jam	60	4 tablespoons

Salt-free Diet

60 Gm. Protein
2,200 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
	BREAKFAST	
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jam	3 tablespoons	45
	LUNCHEON	
Meat	1 serving	45
Potato or substitute	1 serving	100
Vegetable, 3% or 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit, 15%	1 serving	100
	DINNER	
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Fruit, 10%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit, 15%	1 serving	100

Salt-free Diet

70 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 200, Protein 70, Fat 125, Calories 2,205

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	30	2 tablespoons
Milk		
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	135	2 servings (4½ oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	400	4 servings
Potato or substitute	200	2 servings (1 cup)
Sugar and jam	30	2 tablespoons

Salt-free Diet

70 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jelly or jam	1 tablespoon	15
LUNCHEON		
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable, 3% or 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit, 15%	1 serving	100
DINNER		
Meat	1 serving	75
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit, 15%	1 serving	100

NEPHROSIS

The word nephrosis was introduced in 1905 by Friedrich von Müller to express degenerative changes in the kidney in contrast with the inflammatory and the proliferative changes of nephritis. About ten years later, Munk, Volhard, Farr and Govaerts began applying the term clinically. Epstein, who champions the view that this entity is indicative of a profound metabolic disturbance in which there is poor utilization of protein, feels that it is not primarily a disease of the kidneys and he advocates a very high protein diet. Other terms, such as lipoid nephrosis, also have been applied.

From the standpoint of the pathologist, it may be helpful to use the term nephrosis for degenerative lesions, but from the clinical standpoint we cannot as yet prophesy whether the pathologist will find, as stated by Christian, "more or less nephrosis or less or more nephritis." For example, patients who in the earlier stages might be regarded as having a true nephrosis may end in death with the finding of a chronic glomerulonephritis. In Bannick's report on lipoid nephrosis and its reaction to glomerulonephritis he has suggested that the lipoid nephrosis and the so-called nephrotic syndrome, in adults at least, are a form of Bright's disease. The question of using the term as a disease entity or rather the name of a syndrome which may occur in the many forms of acute, subacute or chronic nephritis is for research and the future to determine.

In genuine lipoid nephrosis, in which the kidney lesion is not an inflammatory one, as in chronic glomerulonephritis with edema, and the usual signs of nephritis are absent, a very high protein diet may be given without any fear. On the other hand, high protein diets may be aggravating to an existing kidney lesion, and there is some evidence that they may even be the cause of kidney damage. With this in mind, the high protein diet must be used cautiously, particularly in treating cases with the nephrotic syndrome which may have an associated chronic nephritis.

The oustanding clinical findings of nephrosis are: Edema with marked albuminuria (during edematous stage small amount of urine; as edema lessens urine volume increases) ; a decrease in blood proteins with relative increase in globulin, and decreased albumin reversing the usual albumin to globulin ratio; the presence of double refracted lipoid droplets in the urine; an increase in blood lipoids; a decreased basal metabolism often as low as from minus 30 to minus 40. With these findings there is an absence of the usual signs of nephritis, such as hematuria, increased nonprotein nitrogen, urea, uric acid or creatinine in the blood, impaired excretion of phthalein and high blood pressure.

Barker and Kirk, working in Christian's clinic, have been able to show experimentally facts which suggest that in nephrosis the clinical features result primarily from the protein loss consequent to a marked albuminuria and that the edema is perhaps due to physiochemical changes incident to the continued loss of blood protein. Fishberg, at Beth Israel Hospital, New York, has shown the development of lipoidemia as a compensatory phenomenon for protein decrease.

Whatever its true nature may be, the presence of nephrosis does not mean that a definite and isolated form of pathologic lesion will be found in the kidney; there may be degenerative lesions of the tubules with normal-appearing glomeruli, or there may be inflammatory and proliforative glomerular lesions that will progress into typical chronic glomerular nephritis. Further, all these lesions may be found by the pathologist and yet the patient may never have manifested signs of nephrosis clinically.

The important practical contribution of the studies of nephrosis is with regard to the protein loss and the emphasis on the need of giving a liberal amount of protein to replace the loss of albumin in cases of edema when the phthalein output is good and there is no increase in blood urea or other evidence of renal incompetency.

While exceedingly high protein diets, such as from 200 to 250 Gm. a day, may be impossible for many patients to take day in day out, a high protein intake of from 80 to 150 Gm. is ordinarily tolerated and will often accomplish wonderful results. Certainly in all cases presenting the nephrosis syndrome with no nitrogen retention in the blood, a diet rich in protein should be given a trial.

Important Factors in Dietary Treatment of Nephrosis

1. Protein: High
2. Fluid: Low
3. Salt: Low
4. Fat: Low
5. Carbohydrate: High

These factors are now dismissed briefly.

Protein—High. The chief difference in the diet prescribed for nephrosis and chronic nephritis with edema is the greater emphasis on a high protein intake and lower fat content. The reason for this difference is the belief that, in a large part, the edema of nephrosis is the result of the low blood protein content. One should be very cautious in the use of high protein diets when there is nitrogen retention in the blood.

Fluid—Low. The fluid intake must be limited to an amount that will approximately balance the output of the kidney without the influence of diuretics. When diuretics are used, the fluid intake should be restricted, regardless of the output as influenced by the diuretics.

Salt—Low. The salt content of the diet should be kept low. A diet is considered low in salt if only a sparing amount of salt is used in the preparation of the food and no extra salt or other condiments are used at table or when the food is served. A normal amount of salt is allowed in the bread and the butter. Such a diet contains approximately from 2 to 4 Gm. of salt daily. In some cases of chronic nephrosis it may be desirable or necessary to place the patient upon a salt-free diet. A salt-free diet is one in which all food is prepared without salt, even the bread and the butter being salt-free, and no salt or other condiments are added at table. Such a diet contains approximately 0.5 Gm. of salt daily.

Fat—Low. In nephrosis, the blood plasma being low in protein and high in lipoid content, it is necessary that the diet be low in fat in order that a more economical use of protein may be permitted.

Carbohydrate—High. The carbohydrate content should be high, primarily because its protein-sparing properties are more efficient than fat. When there is a tendency to nausea, it is more likely to be better tolerated than fat.

Directions for Application of Diets

The high protein diets for cases with nephrosis are presented in three forms: the first contains 80 Gm. of protein with 2,000 calories; the second, 100 Gm. of protein with 2,200 calories; and the third, 150 Gm. of protein with 2,600 calories.

The diets may be made either free of salt or low in salt as the case necessitates, depending upon the edema present.

The approximate average water and mineral content, expressed in grams, of the diets is:

Water	1220.
Sodium	0.804
Potassium	3.808
Calcium	0.541
Magnesium	0.308
Chloride	0.861
Phosphorus	1.454
Sulfur	1.263
Iron	0.0211

TYPES OF NEPHROSIS

The limits of nephrosis are wide. On one hand, the nephrosis is represented by a mild degree of renal degenerative change accompanying febrile disease and demonstrable, clinically perhaps, by only albuminuria; on the other hand, the disease may be very severe and associated with marked renal changes, which may in part be responsible for the patient's death.

Although classification is not satisfactory, one may find various groups, such as (1) simple or toxic nephrosis; (2) bile nephrosis cases associated with obstructive jaundice; (3) chemical nephrosis, such as bichloride of mercury poisoning; and (4) kidney of eclampsia and pregnancy. Nephrosis is often a transitory condition and subsides when the cause is removed. Regardless of the type of nephrosis, the basic principles of dietary procedure remain the same.

80 Gm. Protein
2,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 285, Protein 80, Fat 60, Calories 2,000

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	20	2 squares
Salad dressing with oil		
Milk (skimmed)	100	½ glass
Cream, 20%		
Cream, 40%		
Meat (lean)	180	2 large servings (6 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings (1½ cups)
Fruit, 10% Fruit, 15%	400	4 servings
Potato or substitute	200	2 servings (1 cup)
Sugar	30	2 tablespoons
Jelly or jam	105	½ cup (7 tablespoons)

80 Gm. Protein
2,000 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
	BREAKFAST	
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread (toast)	1 slice	30
Butter	½ square	5
Sugar	2 tablespoons	30
Jelly or jam	2 tablespoons	30
Milk (skimmed)	½ glass	100
	LUNCHEON	
Meat	1 large serving	90
Potato or substitute	1 serving	100
Vegetable, 3% or 6%	2 servings	200
Bread	1 slice	30
Butter	½ square	5
Fruit	1 serving	100
Jelly or jam	3 tablespoons	45
	DINNER	
Meat	1 large serving	90
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	100
Fruit salad	1 serving	100
Bread	1 slice	30
Butter	1 square	10
Fruit	1 serving	100
Jelly or jam	2 tablespoons	30

100 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 290, Protein 100, Fat 70, Calories 2,190

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	20	2 squares
Salad dressing with oil		
Milk (skimmed)	100	½ glass
Cream, 20%		
Cream, 40%		
Meat (lean)	225	2 very large servings (8½ oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	400	4 servings
Potato or substitute	200	2 servings
Sugar	15	1 tablespoon
Jelly or jam	90	6 tablespoons
Candy	40	4–5 small pieces

100 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread (toast)	1 slice	30
Butter	½ square	5
Sugar	1 tablespoon	15
Jelly or jam	2 tablespoons	30
Milk (skimmed)	½ glass	100
LUNCHEON		
Meat	1 very large serving	120
Potato or substitute	1 serving	100
Vegetables, 3% or 6%	2 servings	200
Bread	1 slice	30
Butter	½ square	5
Jelly or jam	2 tablespoons	30
Fruit	1 serving	100
3 P.M. Candy	4–5 small pieces	40
DINNER		
Meat	1 very large serving	135
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	100
Fruit salad	1 serving	100
Bread	1 slice	30
Butter	1 square	10
Jelly or jam	2 tablespoons	30
Fruit	1 serving	100

150 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 310, Protein 150, Fat 85, Calories 2,605

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter		
Salad dressing with oil		
Milk (skimmed)	100	½ glass
Cream, 20%		
Cream, 40%		
Meat (lean)	450	2 very large servings (15 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% Fruit, 15%	400	4 servings
Potato or substitute	200	2 servings
Sugar	30	2 tablespoons
Jelly or jam	135	9 tablespoons

150 Gm. Protein
2,600 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread (toast)	1 slice	30
Sugar	2 tablespoons	30
Jelly or jam	3 tablespoons	45
Milk (skimmed)	½ glass	100
LUNCHEON		
Meat	1 extra large serving	225
Potato or substitute	1 serving	100
Vegetable	2 servings	200
Bread	1 slice	30
Jelly or jam	3 tablespoons	45
Fruit	1 serving	100
DINNER		
Meat	1 extra large serving	225
Potato or substitute	1 serving	100
Vegetable	1 serving	100
Fruit salad	1 serving	100
Bread	1 slice	30
Jelly or jam	3 tablespoons	45
Fruit	1 serving	100

RENAL ARTERIOSCLEROSIS

This is the type of kidney disease that is considered the anatomic counterpart of essential hypertension. Hypertension, nitrogen retention and polyuria are the main factors, and, if edema occurs, it is due to heart failure rather than to the kidney damage.

The kidney of renal arteriosclerosis becomes increasingly inefficient, and the time ultimately arrives when uremia can be held off no longer. Dietary precautions should be started early and continued persistently in order to prevent the occurrence of uremia as long as possible. It is not known how effective diet restriction is in forestalling uremia, but the opinion exists that a great deal can be done by judicious dietary management. When the period of impending uremia arises, acidosis develops.

Important Factors in Dietary Treatment of Renal Arteriosclerosis

1. Protein: Low
2. Calories: Low
3. Alkaline ash rather than acid ash
4. Salt: Low
5. Fluid: Adequate amount (2,000 cc. or more a day)
6. Vitamins: High (emphasis on vitamin B)

UREMIA

Uremia is brought on by the retention of urinary products. It occurs when there is a deficient elimination of urine, whether due to any form of nephritis, obstruction of the urinary tract or any other condition.

The symptoms are headache, dizziness, disturbance of vision, gastro-intestinal upset, muscular twitchings, uriniferous odor to the breath, dyspnea, convulsions and coma.

In acute and in chronic nephritis the treatment of uremia is, of course, to prevent the occurrence of a serious uremic state. When convulsions and coma have developed, death is almost inevitable.

Elimination is, of course, the proper means of treating uremia. This involves three procedures: sweating, catharsis and venesection.

The question of pushing fluids as a means of increasing elimination and of diluting toxic substances, though contrary to advice given in the general management of acute nephritis, is probably the best procedure, because increased fluid intake is needed to offset fluids lost in sweating and in catharsis. Increased fluid also causes diuresis, favoring elimination of toxic substances, and even though no diuresis takes place and water is stored temporarily as edema, the toxins are diluted and later, if the crisis is passed, the edema so produced will disappear.

Important Factors in Dietary Treatment of Uremia

1. Protein: Low
2. Salt: Low
3. Water: Adequate
4. Carbohydrate: High

The diet used for uremia is either limited to milk or one of the diets outlined for acute nephritis, pages 258 to 267.

Uremia is precipitated by a faulty formation of ammonia by the kidneys and the retention of acid production in the blood and the apparent inability of the uremic patient to be able to prevent the loss of salt when conservation is urgently needed. The kidney, in this late stage, is known to waste the bases of the body rather than conserve them. The therapeutic indication then is to give fluids and salt (Ringer's solution), in quantities of 1,500 cc. or more a day, for the purpose of maintaining the water balance and electrolyte equilibrium of the body. Rigid restriction of sodium chloride is not indicated in late nephritis, because a hypochloremia as well as a substantial loss of sodium is present. When sodium chloride and sufficient fluids cannot be taken by mouth, a normal saline solution may be given intravenously.

Diseases of the Digestive Tract

PEPTIC ULCER

Nature of Condition

An ulceration located either in the stomach or the duodenum and at times in the jejunum after gastroenterostomy

Object of Diet

Adequate nourishment with the least irritation to the ulcerated surface

Ulcers of the stomach and the duodenum are fundamentally alike. Such differences as exist are due very largely to the complications peculiar to the stomach and the duodenal location of the ulcer. They may be simple, multiple, penetrating or perforating, obstructive or hemorrhagic in type. The etiology of gastric and duodenal ulcers as they occur clinically has not been satisfactorily established in all particulars.

The duration of the history, the time of appearance of pain, the degree of food relief and, above all, the roentgenologic findings, when positive, give evidence as to the location. The gastric, the duodenal and even the postoperative gastrojejunal ulcer should respond to the same type of treatment; therefore, all three demand in principle the same dietary regulation.

The subjective symptoms of peptic ulcer are fairly clean-cut. When a patient presents the history of several years of intermittent and periodic attacks of distress in the epigastrium, burning and gnawing in character, coming on from two to three hours after meals and relieved by alkalis or eating, and lasting from four to six weeks, one may suspect at once a duodenal or gastric ulcer. In cases in which there is a good history—high acids, positive roentgenologic findings, relief by taking food or alkalis—the diagnosis is simple. In many cases, the consideration of complications is necessary, and the evidence may be contradictory. Chief of these complications are chronic appendicitis with reflex pylorospasm, cholecystitis with or without adhesions and ulcer at, or very near, the pylorus. In many of these puzzling cases, medical treatment is used as a differential diagnostic effort. The simple, uncomplicated ulcer in a patient resting in bed on a proper diet and medical management should cease giving distress in a day or two. If distress continues, the possibility of complications must be considered.

IMPORTANT FACTORS IN DIETARY TREATMENT OF PEPTIC ULCER

1. Adequate nourishment with frequent small feedings
2. Avoidance of mechanically and chemically irritating foods
3. Avoidance of foods that stimulate gastric secretion
4. Protein foods desirable
5. Fat foods desirable
6. Diet sufficient in vitamins

These factors are now discussed briefly.

Adequate Nourishment with Frequent Small Feedings. Adequate nourishment must never be lost sight of, and, although the feedings should be small in bulk, the intervals must be increased in frequency. The stomach should never be completely empty or completely filled. Frequent feedings are desirable also to neutralize the free hydrochloric acid.

Avoidance of Mechanically and Chemically Irritating Foods. In order to avoid mechanical irritation, foods should be as soft and smooth as possible, rough fibers and sharp seeds being omitted. Foods which are chemically irritating, such as sweet, acid, salty or spicy types, should not be used.

Avoidance of Foods that Stimulate Gastric Secretion. All foods that stimulate gastric secretion, such as meat extractives, concentrated acid fruits, coffee, tea and alcohol, should be excluded. Tobacco should be forbidden.

Protein Foods Desirable. Protein foods, such as milk and eggs, are desirable, since they bind the free hydrochloric acid present in the stomach and aid in neutralizing the acidity.

Fat Foods Desirable. Fats, especially such fats as cream, butter and olive oil, are important because of their inhibitory effect on gastric secretion and also because of their high caloric value. A diet relatively high in fats, which are slowly evacuated, seems to be well borne by the majority of patients with ulcers.

Diet Sufficient in Vitamins. The vitamin content is important, especially since the diet must be continued over a considerable period of time. The addition of necessary vitamins, particularly vitamin C (cevitamic acid) may aid in healing the mucosal defect and counteract the danger of bleeding.

DEVELOPMENT OF MEDICAL TREATMENT OF PEPTIC ULCER

Probably no branch of dietetics has become more standardized than the treatment of peptic ulcer. A review of classic diets shows that Lenhartz advocated an iced milk and egg diet, this being gradually increased from seven ounces of milk and one egg per day to 1¾ pints of milk and eight eggs per day, with the addition of meat after two weeks' treatment. Senator favored a fat diet—large quantities of iced butter, carbohydrates and little protein. Boas advised olive and almond oil and other fats which have a low boiling point. Hurst, von Leube, Salisbury and Jarotzky popularized diets which are known by their names. Since 1904, the Sippy regimen, or one of its modifications, has been most generally followed in this country. The chief innovation of this method is the incorporating of alkaline powders between feedings to aid in neutralizing acids during the entire period of digestion throughout the day. The good results that have been achieved by the many different diets advocated is a tribute to the recuperative ability of the stomach under medical treatment, especially during rest in bed.

The management of ulcer treatment involves complete rest of mind and body, small and frequent feedings of a bland diet, the neutralization of excessive acid by diet and drugs, and the removal of stagnant gastric contents from the stomach by lavage when necessary.

In the past few years many different methods in the treatment of peptic ulcer, such as various modifications of diet, different types of alkaline powders, mucin, nonspecific protein, aluminum hydroxide and the continuous-drip method, have each had their period of success and their advocates.

Indications for Surgery. In all cases of uncomplicated ulcer it is most important that surgical measures be not undertaken until adequate and complete medical treatment has been given a fair trial and has failed.

Surgery is indicated when in the presence of:

1. One of four complications:
    (a) Pyloric obstruction
    (b) Acute and subacute perforation
    (c) Carcinomatous degenerating ulcer
    (d) Repeated or uncontrolled hemorrhage
2. Chronicity and failure to respond to medical and dietary treatment.

It must be remembered that surgical procedures are definitely contraindicated during the time of bleeding, except in the case of failure of the accepted measures.

DIRECTIONS FOR APPLICATION OF DIETS

Each patient presents a different problem, depending upon the type and the location of the ulcer, although the general dietary principles are the same. The first thing to do in instituting medical treatment is to put the patient to bed at complete rest. Tobacco and alcohol should be prohibited. The diets suggested are a modification of the Sippy treatment. The patients, whether in hospital or at home in bed, are first started on Diet 1. This diet contains from three to four ounces of a mixture of milk and cream given every hour from 7 A.M. until 9 P.M. The diet alone may not be adequate to keep the free hydrochloric acid neutralized, consequently additional medication may be necessary.

Ordinarily, Diet 1 is used for about seven to ten days, depending upon the location of the ulcer and the response of the patient to treatment. When the patient is ready to be placed on Diet 2, the milk and cream feedings are kept up as per schedule in this diet. Small meals are substituted for the milk and cream at eight, twelve and six o'clock. These meals consist of cooked cereals with cream, egg, crisp toast, butter, cream soups and simple desserts such as custards, jello, rice or tapioca pudding, prune whip, Bavarian cream made from the bland fruit juices strained, etc.

From two to three weeks after beginning the treatment of peptic ulcer the patient should be able to start Diet 3, which is a bland diet and is adequate in the essential food requirements, furnishing protein and calories to meet the needs of a normal adult. In cases in which a lower caloric intake is indicated, milk may be substituted for the cream in the diet. The diet may be increased in calories by adding butter or more cream.

Diet 3 is continued after the patient is dismissed from the hospital or when he is allowed to be ambulatory at home. He should be cautioned not to depart from instructions regarding the type of foods to be allowed and those to be avoided, as outlined on page 301. It is important that the milk and cream mixture be continued midway between the three meals and at bedtime. It may also be advisable to give some milk (one-half glass) when the patient first awakens in the morning. Emphasis should be placed upon the punctuality of all diet and medical treatment. Tobacco, condiments and alcohol and physical and mental strain are to be avoided. Many times slight distress may be controlled by food, especially milk or milk and cream. The ambulatory diet should be followed carefully from six months to a year. The patient should report occasionally and be carefully followed for two or three years.

Typical Foods Used in the Treatment of Peptic Ulcer

Cereal:
- Oatmeal
- Cream of wheat
- Farina
- Breakfast brownies
- Ralston
- Rice
- Corn flakes
- Puffed rice
- Puffed wheat
- Rice Krispies
- Rice flakes

Bread:
- White
- Graham

Egg:
- Soft-cooked
- Poached
- Soufflé
- Baked omelet

Fruits—cooked or canned
- Apple
- Prune
- Peach
- Pear
- Apricot
- White cherry
- Banana

Fruits—raw:
- Ripe banana
- Ripe pear
- Orange juice

Cheese:
- Soft cream cheese
- Cottage cheese

Meat:
- Chicken
- Fish
- Lamb
- Liver
- Scraped beef
- Sweetbreads
- Oyster
- Bacon

Potato:
- Boiled
- Creamed
- Scalloped (with toast crumbs)
- Mashed
- Baked

Vegetables:
- Carrot
- Squash
- Beet
- Pea
- *Tender* lettuce
- Spinach
- String bean
- Asparagus
- Cauliflower
- Strained tomato

Desserts:
- Gelatin, such as:
  - Bavarian cream made from juices of fruit listed above
- Ices and ice cream
- Puddings:
  - Rice
  - Tapioca
  - Prune whip
  - Graham whip
  - Blanc mange
  - Grape sponge
- Cake:
  - Sponge
  - Angel food
  - Hard-sugar cookies

Beverages:
- Coffee substitutes, such as:
  - Kaffee Hag
  - Sanka coffee
  - Postum
- Milk
- Cocoa or chocolate

Condiments:
- Salt

Typical Foods to be Avoided in the Treatment of Peptic Ulcer

- Coarse cereals and breads
- Coarse vegetables and fruits
- Concentrated acid fruits and vegetables
- Raw fruit and vegetable salads
- Pork, veal, salmon, sardine
- All fried or greasy foods
- Spices and condiments other than salt
- Coffee, tea.

ADDITIONAL TREATMENT FOR PEPTIC ULCER

ALKALINE THERAPY

Peptic ulcer occurs in that portion of the digestive tract which is bathed in acid gastric secretions. Sippy rationalized that healing of the ulcer would occur more readily if the hydrochloric acid in the stomach were neutralized completely. The results obtained by his method exerted a profound influence on the medical profession in the management of peptic ulcer. The so-called Sippy treatment was superior to that of any previously used. He insisted upon complete neutralization of the gastric acidity. Excessive secretion was removed at frequent intervals through the stomach tube, the acidity was determined and soluble alkalis were administered in sufficient doses to ensure complete neutralization. At present the complete neutralization regimen of Sippy is used by very few gastroenterologic internists.

Many clinicians believe that complete neutralization cannot be obtained without causing periodically an unphysiologic alkalinization of the gastric contents. It has been shown that an excess of soluble alkalis provokes a secretagogue effect on gastric secretion, actually increasing rather than diminishing the secretory work of the stomach. Furthermore, it was found that other deleterious side effects may follow the overzealous employment of soluble alkalis. An alkalinization of the blood and the urine is particularly undesirable. There is some evidence to show that the prolonged use of soluble alkalis may encourage the precipitation of calculi in the urinary tract in some cases of peptic ulcer.

Perhaps the principal reason for the present unpopularity of the complete neutralization treatment was the discovery that hourly feedings of milk without alkalis were as efficient in producing symptomatic relief and ulcer healing as the complete neutralization system of Sippy. The author has not used the strict Sippy regimen in the treatment of uncomplicated ulcer for many years and often finds it unnecessary to use any alkali. When patients with an active ulcer associated with hyperacidity, hypersecretion and intractable symptoms show a lack of response to ordinary measures, it is advisable to reduce the acid-pepsin content of the gastric juice.

Beckman has stated that the ideal alkali is insoluble; does not irritate the stomach and the intestines; is neutral in aqueous suspension but capable of neutralizing acid; does not unduly alter the acid-base equilibrium in the body; when taken in any reasonable amount will not alkalize the urine with attendant danger of precipitating crystalline phosphates in the kidney or ureter; will not cause diarrhea or constipation; and will not seriously alter mineral metabolism. Hollander has recently commented on the degree of neutralization of gastric acidity which is necessary for ordinary purposes in the treatment of ulcer. He has assumed that the acid-peptic factor was the major one in the development of ulcer and found that peptic activity practically ceased at a pH of 4.5 to 5, yet complete neutralization requires an elevation of the pH to at least 7. He believes that the critical value of alkaline therapy is achieved at the so-called proteolytic neutralization point, i.e., a pH at which the digestion of protein in the stomach is reduced to a minimum. This concept of alkaline-therapy requirements in the management of ulcer seems logical, and certainly is the most easily accomplished without untoward effects.

With the turn of the twentieth century, strong advocates of the use of alkalis in addition to diet as a means of neutralizing the gastric acidity found many enthusiastic followers. This has been accomplished with more or less success by the use of sodium bicarbonate, calcium carbonate, magnesium oxide, bismuth subcarbonate, sodium citrate, hydrated magnesium trisilicate and tribasic calcium and magnesium phosphates. The objections to the use of most alkaline powders are: Short-lived acid neutralization, danger of alkalosis, secondary acid rise and sometimes influence on the motility of the intestine. Incidentally, patients with impaired renal or liver function are more prone to develop alkalosis. Many physicians question the need for neutralization of acids in peptic ulcer. Block, Serby, Crohn and Reiss feel that most patients get along just as well with little or no alkalis. Various kinds and different proportions of alkali have been suggested and used in the effort to neutralize the hydrochloric acid of the gastric juice. Two types of alkaline powders, designated as Powder 1 and Powder 2, are commonly used. Powder 1 may contain 0.5 Gm. calcium carbonate and 0.3 Gm. sodium bicarbonate. Powder 2 may contain 0.5 Gm. calcium carbonate and 0.4 Gm. calcium magnesium. The powders are subject to adjustment according to the needs of the patient. Ordinarily Powders 1 and 2 are alternated. If the patient develops loose stools or diarrhea, some of Powder 1 may be substituted for Powder 2. If constipation is troublesome, some of Powder 2 may be substituted for Powder 1.

The administration of large amounts of the alkalis of the type just discussed may lead to alkalosis by producing an increased secretory activity of the fundic glands. It is then difficult to control or materially reduce acidity, and often immoderate increase of the amount of alkalis used to accomplish neutralization will result in symptoms of toxemia. This is accompanied by an elevation of blood urea and an increase in the carbon-dioxide combining power of the blood plasma.

Soluble Alkalis—Sodium Bicarbonate. Its efficiency in therapy evidently depends upon the rapidity with which neutralization occurs. Apparently sodium bicarbonate relaxes the pylorus somewhat by the liberation of carbon dioxide, which may evoke eructation of gas. It is probably the least desirable of all the alkalis for constant use.

Magnesium Oxide and Magnesium Carbonate. Magnesium oxide in large doses possesses most of the disadvantages of sodium bicarbonate but rarely produces gastric distention or eructation. It has the most efficient neutralizing action weight for weight of any of the soluble alkalis.

Other Alkalis. Calcium carbonate, sodium and potassium citrates and tribasic calcium and magnesium phosphate exert less than one fifth of the neutralizing power of magnesium oxide. They are slightly inferior in this respect to sodium bicarbonate, but on the other hand they lack the undesirable ability to produce a secondary hypersecretion. For this reason, calcium carbonate, in combination with small doses of magnesium oxide and possibly one of the bismuth salts, constitutes an alkaline mixture without any great deleterious effect if its use is not unnecessarily prolonged. The tribasic phosphates of calcium and magnesium are somewhat less efficient.

In a series of experiments done at Guy's

Hospital it was found that calcium carbonate, magnesium carbonate and sodium and potassium citrates are quite efficient in neutralizing the acid gastric juice without having the disadvantages of sodium bicarbonate.

The tribasic calcium and magnesium phosphates have the advantage over sodium bicarbonate and other soluble alkalis in that they neutralize gastric hyperacidity without producing abnormal systemic alkalinity, do not increase the flow of hydrochloric acid into the stomach and do not injure the kidneys.

Bismuth Salts. An excess of bismuth subcarbonate added to a solution of 0.3 per cent hydrochloric acid only reduces the acidity to pH 4.0, the solution never becoming neutral. Bismuth subnitrate probably has no neutralizing effect on the gastric acidity, yet the bismuth salts seem to have a beneficial effect on ulcer symptoms in some cases. Hurst believes that the favorable influence of bismuth salts may depend upon their power of stimulating the secretion of mucus.

Nonabsorbable Alkalis. Fortunately, many of the disadvantages of the alkalis have been overcome by the introduction of drugs capable of neutralizing and fixing the gastric acid without causing systemic alkalinization and without bringing about a secondary stimulation of gastric secretion.

Colloidal Aluminum Hydroxide and Phosphate. Crohn was one of the first clinicans in the United States to employ colloidal aluminum hydroxide in the treatment of peptic ulcer. He reported satisfactory results, claiming that it reduced the emptying time of the stomach and lowered the gastric acidity and was devoid of deleterious side effects.

The advocates of colloidal aluminum hydroxide as a valuable adjunct to ulcer management stress the lack of any appreciable degree of absorption of the drug. No change was found in the pH or carbon-dioxide combining power of the blood. Another advantageous effect of colloidal aluminum hydroxide is that it may increase the secretion of mucus, and in that way protect the gastric mucosa against further injury.

Certain contraindications to the use of colloidal aluminum hydroxide require discussion. There is some evidence to suggest that very large doses of the alkali may delay emptying of the stomach in some patients with peptic ulcer, particularly those with persistent pylorospasm.

It is possible that aluminum phosphate gel may gain in popularity, since it seems to be fully as efficient as the hydroxide, does not predispose toward a phosphorus deficiency, and has proved of value both in the prevention and the healing of Mann-Williamson ulcers.

Magnesium Trisilicate. The profession is indebted to Mutch for the introduction and the original investigation of synthetic hydrated magnesium trisilicate.

Synthetic Resin. A synthetic plastic resin chemically similar to bakelite with acid-adsorbing qualities has revolutionized neutralization procedures in industrial chemistry. So much resin was required to neutralize a small amount of acid that its application to medicine was not practical.

In 1946, Martin prepared a resin with improved acid-adsorbing power, warranting a clinical trial as an acid adsorber for peptic ulcer. Studies on human gastric juice showed that this synthetic resin was effective in bringing the pH of the gastric juice to levels satisfactory for healing ulcer. Kraemer and Siegel treated fifty peptic-ulcer patients with Martin's preparation of a polyamine-formaldehyde resin (amberlite IR4), giving from 2 to 6 Gm. per day for nine months. They found no disagreeable effects on the bowel and no toxic effects. They reported that synthetic resin acted in as satisfactory a manner in regard to healing peptic ulcers as any of the metallic salt antacids usually employed, and that it had none of their disadvantageous side effects.

Directions for Use of Any Alkalis

The amount of alkali needed to control the acidity is determined by aspirations of the gastric content and the analysis of it. Occasionally part of the alkalis may be omitted. When night distress occurs or the patient awakens at night, a glass of milk or alkali is indicated. It is very important to control the night secretion.

A suggested time distribution when any of the alkalis are used is outlined in relation to the food intake along with the various diets for ulcer.

When the patient is ambulatory after from two to four months, the alkalis may be gradually lessened and finally discontinued, provided the symptoms are controlled by the diet alone.

After discontinuing any of the alkalis, if symptoms recur and are not readily controlled and the distress persists, it is well to return to the routine use of them. If at any time during the treatment with Diet 3 with alkalis the patient is unable to control the distress, it may be necessary to return to Diets 1 or 2, depending upon the degree, the severity or the difficulty in controlling the distress.

DRUGS FAVORABLY INFLUENCING EXCESSIVE MOTOR AND SECRETORY ACTIVITY

Drugs which relax smooth muscle and curtail interdigestive hypersecretion are of great value in many intractable cases of peptic ulcer. Belladonna and its alkaloid atropine depress the overacting vagus, reducing both the motor and the secretory activity of the stomach if used in adequate doses.

If secretory depression and motor inhibition are desired, the dose of belladonna should be increased until its physiologic effect is indicated by dryness of the mouth or dilatation of the pupils. When this is accomplished, the quantity may be diminished slightly, the dose being maintained just below the level of intolerance. From seven to ten drops of the tincture of belladonna every four hours during the day may be used. Each day the individual dose is increased one or two drops until the desired physiologic effect has been produced. A dose of atropine sulfate, given at six in the evening and at ten, will be found very efficacious in controlling night secretion, night pain and night vomiting in many cases.

Substitutes for belladonna and atropine have been introduced in an effort to obtain the antispasmodic and secretory inhibiting effects without the disagreeable side effects. Syntropan has been recommended three or four times daily for this reason. Novatropine and trasentine have been introduced for similar reasons.

Papaverine, an alkaloid of opium (from ½ to 2 grains), may be combined with the antispasmodics for brief periods during the early stage of ulcer management in very nervous patients or in those with unbearable pain. Papaverine acts on the smooth muscle of the arteries, the stomach, the intestines, the gallbladder and the biliary passages. It is also a strong dilator of the coronary and peripheral vessels and is only mildly constipating.

Sedatives. Central-nervous-system sedatives have definite value in the treatment of many patients during the stage of ulcer activity. Patients showing evidence of grave apprehension, nervous tension, grief, insomnia, hypersensitiveness to pain or pain of marked severity usually benefit when sedatives are employed. A teaspoonful of the elixir of phenobarbital (¼ grain) every fourth hour and two teaspoonfuls before retiring may be sufficient. Belladonna may be added to the elixir of phenobarbital if an antispasmodic is desired. A sedative is rarely required for more than one week. A hypodermic injection of atropine sulfate (1/100 grain) combined with phenobarbital sodium (from ½ to 3 grains) before retiring is an ideal remedy for regularly recurring night pain. The use of adequate amounts of atropine and phenobarbital together with large doses of nonsoluble alkalis at night usually renders the various continuous-drip treatments unnecessary.

SPECIAL METHODS WHICH MAY BE EMPLOYED IN ULCER THERAPY

Continuous-Drip Method. The alkalinized milk drip of Winkelstein, introduced in 1933, has proved to be of value in selected cases. A mixture of 5 Gm. of sodium bicarbonate in one quart of whole milk is allowed to drip into the stomach through a small nasal or oral tube at the rate of from thirty to forty drops per minute. During the first one to three weeks of treatment, depending upon the severity of the case, a continuous drip is maintained day and night. When progress has been satisfactory and symptoms have been relieved for a variable period, the drip is discontinued during the day, the patient receiving conventional ulcer therapy of bland feedings every hour or two with alkalis and atropine from 8 A.M. to 8 P.M. At 8 P.M. the drip is begun and continued nightly until four weeks have elapsed. While on the twenty-four-hour drip treatment, the patient receives about three quarts of milk and 15 Gm. of sodium bicarbonate each day.

Since milk introduced continuously has a high combining power with acid, it might be well to eliminate the sodium bicarbonate in order to avoid the danger of systemic alkalinization. In some intractable ulcer cases, the drip method may be employed only at night for the control of night distress and the usual hourly feedings may be given during the day.

Continuous-drip therapy is not essential to the management of most cases of ulcer. The method is of value if marked hypersecretion and night pain cannot be controlled, or if the more orthodox medical procedures have not brought about satisfactory relief for any reason other than a surgical complication.

The twenty-four-hour aluminum hydroxide drip method competes with the milk drip, since its purpose is that of complete twenty-four-hour neutralization of the gastric acid. The plan originally was suggested by Woldman and Rowland; they used a solution of 200 cc. of 7 per cent colloidal aluminum hydroxide in 600 cc. of distilled water. The plan has been utilized successfully by many others.

A combination of the two methods seems rational. The milk drip during the day would supply the caloric requirements and keep the acid sufficiently neutralized. The aluminum hydroxide drip during the night should have no stimulating effect on gastric secretion and should keep the interdigestive secretion neutralized.

Removal of Gastric Contents. If night pain or vomiting persists after two or three days of strict ulcer management in spite of physiologic doses of belladonna and a night dose of atropine and phenobarbital, the stomach should be emptied night and morning to eliminate the excessive secretions. If this measure also fails to give relief, one of the continuous drip methods should be tried. Ordinarily the passage of the stomach tube for the removal of gastric secretions is reserved for those patients with gastric stasis due to organic obstruction or persistent pylorospasm. Even in the absence of obstruction, benefit may accrue from gastric evacuation in cases of marked hypersecretion.

Enterogastrone in Peptic Ulcer. Ivy and his associates have described a method for the preparation of an enterogastrone concentrate of uniform potency suitable for parenteral injection in the human. Therapeutic trial on fifty-eight patients suffering from proven peptic ulcer over a period of years has demonstrated the probability that the material is effective in preventing recurrences during the period of its administration and for a length of time thereafter of a duration as yet undetermined. The protection afforded cannot be explained on the basis of the action of enterogastrone in inhibiting gastric secretion, and the true nature of the agent concerned cannot be defined at present. This treatment is still in the experimental stage.

Mucin Therapy. The usefulness of mucin in the treatment of peptic ulcer has created considerable comment in the past few years. Its effect as a therapeutic measure is assumed to be due to its diluent and neutralizing properties on gastric acidity. It is also supposed to protect the gastro-intestinal tissues locally against the proteolytic action of the acid gastric juice. Fogelson, Gilbert, Atkinson, Brown and others have reported very striking results from its use. Other investigators have not been so successful in their experience with mucin.

When mucin is used, it is incorporated in the milk and cream allowance for one day, according to the recipe on page 729. This mixture is kept cold and is given in from four- to six-ounce feedings similar to the directions for the application of Diets 1, 2 and 3. The mucin mixture is used in place of the milk and cream feedings in these diets.

In Diet 3, a glass (2,000 cc.) of mucin mixture is given with each meal and one glass at 10 A.M., 3 P.M. and 9 P.M., replacing the milk and cream in the diet.

Aluminum Hydroxide Mixture with Mucin. Hardt has advocated approximately 20 per cent of histamine free gastric mucin added to a mixture of aluminum hydroxide and magnesium trisilicate. He reports that gastroscopically this mixture was found to have a much better coating effect in treating peptic ulcer, remaining longer in the stomach than aluminum hydroxide, magnesium trisilicate gels or other antacids. This mixture seems to have a more prompt neutralizing effect and clinical response, particularly in some of the intractable cases which do not respond to other antacids.

PROBLEMS OF PEPTIC-ULCER TREATMENT

Every ulcer case is an individual matter, and a suitable plan of treatment should be outlined to meet specific needs. The possible development of food-deficiency diseases following too rigid an ulcer diet for a protracted period must be borne in mind. Recurrences in the majority of cases are due to carelessness in diet, use of tobacco or alcohol, business worries, overwork, lack of proper rest or an onset of acute intercurrent infection. The present state of confusion in the world and the lack of economic, political and social security contribute much to disease in general and ulcers in particular. Only by the creation of an environment of relaxation can better control in the management of the peptic-ulcer patient be hoped for.

Diet 1

First Stage Management

55 Gm. Protein
2,520 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 90, Protein 54, Fat 216, Calories 2,520

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)		
Bread		
Butter		
Salad dressing with oil		
Milk	900	4½ glasses (30 oz.)
Cream, 20%	900	4½ glasses (30 oz.)
Meat (lean)		
Bacon		
Egg		
Vegetables, 3%		
Vegetables, 6%		
Fruit, 5%		
Fruit, 10%		
Vegetable and fruit, 15%		
Vegetable and fruit, 20%		

Diet 1

First Stage Management

55 Gm. Protein
2,520 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

			When Alkalis Are Used Give at:
A.M.	7:00	Milk, 2 oz. Cream, 2 oz.	
			7:30 A.M.
	8:00	Milk, 2 oz. Cream, 2 oz.	
			8:30
	9:00	Milk, 2 oz. Cream, 2 oz.	
			9:30
	10:00	Milk, 2 oz. Cream, 2 oz.	
			10:30
	11:00	Milk, 2 oz. Cream, 2 oz.	
			11:30
M.	12:00	Milk, 2 oz. Cream, 2 oz.	
			12:30 P.M.
P.M.	1:00	Milk, 2 oz. Cream, 2 oz.	
			1:30
	2:00	Milk, 2 oz. Cream, 2 oz.	
			2:30
	3:00	Milk, 2 oz. Cream, 2 oz.	
			3:30
	4:00	Milk, 2 oz. Cream, 2 oz.	
			4:30
	5:00	Milk, 2 oz. Cream, 2 oz.	
			5:30
	6:00	Milk, 2 oz. Cream, 2 oz.	
			6:30
	7:00	Milk, 2 oz. Cream, 2 oz.	
			7:30
	8:00	Milk, 2 oz. Cream, 2 oz.	
			8:30
	9:00	Milk, 2 oz. Cream, 2 oz.	

Diet 2

Second Stage Management

70 Gm. Protein
2,950 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 195, Protein 70, Fat 210, Calories 2,950

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread (toast)	90	3 slices
Butter	40	4 squares
Salad dressing with oil		
Milk	600	3 glasses (20 oz.)
Cream, 20%	660	3¼ glasses (22 oz.)
Meat (lean)		
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15% Purée	225	3 small servings (1⅛ cups)
Fruit, 10%, orange juice	90	½ glass (scant) (3 oz.)
Potato	75	1 small serving
Sugar	10	2 teaspoons
Gelatin dessert and custard	200	2 servings

Diet 2

Second Stage Management

70 Gm. Protein
2,950 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

			Gm.	*When Alkalis Are Used Give at:*
A.M. 7:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	
	BREAKFAST			7:30 A.M.
8:00	Cereal (cooked)	½ cup	105	
	Egg	1	50	
	Crisp toast	1 slice	30	
	Butter	1 square	10	
	Cream	¼ cup (2 oz.)	60	
	Sugar	2 teaspoons	10	
	Orange juice	2 tablespoons	30	
	Beverage—coffee substitute			
9:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	9:30
10:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	
11:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	
	LUNCHEON			11:30
M. 12:00	Cream Soup:			
	Milk	¼ cup (2 oz.)	60	
	Cream	¼ cup (2 oz.)	60	
	Vegetable purée	½ cup, scant	75	
	Vegetable purée	½ cup, scant	75	
	Crisp toast	1 slice	30	
	Butter	1 square	10	
	Dessert	1 serving	100	
	Orange juice	2 tablespoons	30	
P.M. 1:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	1:30 P.M.
2:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	
3:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	3:30
4:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	
5:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	
	DINNER			5:30
6:30	Egg or egg substitute	1	50	
	Potato, baked	1 small serving	75	
	Vegetable purée	½ cup, scant	75	
	Crisp toast	1 slice	30	
	Butter	2 squares	20	
	Dessert	1 serving	100	
	Orange juice	2 tablespoons	30	
7:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	7:30
8:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	8:30
9:00	Milk	1½ oz.	45	
	Cream	1½ oz.	45	

Diet 3

Ambulatory

80 Gm. Protein
2,660 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 225, Protein 80, Fat 160, Calories 2,660

Food		*Gram Weight*	*Household Measure*
Cereal (cooked)		105	½ cup
Bread (toast)		90	3 slices
Butter		40	4 squares
Salad dressing with oil			
Milk		900	4½ glasses
Cream, 20%		300	1½ glasses
Meat (lean)		45	1 small serving (1½ oz.)
Egg		100	2
Vegetables, 3% Vegetables, 6%	Purée	225	3 small servings (1⅛ cups)
Fruit, 10%, orange juice		120	½ glass (4 oz.)
Fruit, 15%, 20%		150	2 small servings
Potato or substitute		150	2 small servings (¾ cup)
Sugar		10	2 teaspoons
Dessert		100	1 serving

Diet 3

Ambulatory

80 Gm. Protein
2,660 Calories

Suggested Distribution of the Total Food Allowance for One Day

			Gm.	*When Alkalis Are Used Give at:*
	BREAKFAST			
				7:30 A.M.
A.M. 8:00	Stewed fruit	1 small serving	75	
	Cereal (cooked)	½ cup	105	
	Egg	1	50	
	Crisp toast	1 slice	30	
	Butter	1 square	10	
	Cream	½ glass, scant	90	
	Orange juice	4 tablespoons	60	
	Sugar	2 teaspoons	10	
	Beverage—coffee substitute			
				9:30
10:00	Milk	¾ glass	150	
	Cream	¼ glass	50	
				11:30
	LUNCHEON			
M. 12:00	Egg or egg substitute	1	50	
	Potato or substitute	1 small serving	75	
	Vegetable purée	1 serving	75	
	Crisp toast	1 slice	30	
	Butter	1½ squares	15	
	Stewed fruit	1 small serving	75	
	Milk	1 glass	200	
	Orange juice	2 tablespoons	30	
				1:30 P.M.
P.M. 3:00	Milk	¾ glass	150	
	Cream	¼ glass	50	
				5:30
	DINNER			
6:00	Cream soup:			
	Milk	¼ glass	50	
	Cream	¼ cup	60	
	Vegetable purée	½ cup, scant	75	
	Meat	1 small serving	45	
	Potato	1 small serving	75	
	Vegetable purée	1 serving	75	
	Crisp toast	1 slice	30	
	Butter	1½ squares	15	
	Milk	1 glass	200	
	Orange juice	2 tablespoons	30	
	Dessert	1 serving	100	
				7:30
8:00 or 9:00	Milk	¾ glass	150	
	Cream	¼ glass	50	
				9:30

POSTOPERATIVE DIETS FOR ULCER OF THE STOMACH OR THE DUODENUM

For the first day or two the patient should not be given any food. After this, if he is doing well, sips of water and weak tea may be given. If this is well tolerated a very small amount of clear chicken broth may be added. All foods and liquids should be served at body temperature.

The first day food is given, as suggested for these cases (pp. 314 to 317), the diet should begin with a very small amount of food. Gradual increases are made each day until about the eleventh day, when the patient is able to take the bland ambulatory diet (3), page 312, containing 80 Gm. protein, 2,660 calories, as suggested for the ulcer patient who is not to be operated upon. This diet should be continued for from three to six months, a return to the normal diet being made gradually. It may then be the patient will have to revert to the bland diet from time to time to relieve symptoms similar to those which he experienced before the ulcer was operated upon. In cases which have shown a tendency to a recurring ulcer, the diet should be continued for from six months to a year before a gradual return to a normal diet is attempted.

First Day Food Is Given

				Gm.
A.M.	8:00	Cereal jelly	3 tablespoons	45
		Rich milk	2 tablespoons	30
	10:00	Rennet custard	¼ cup	60
P.M.	2:00	Cereal jelly	3 tablespoons	45
		Rich milk	2 tablespoons	30
	5:00	Rennet custard	¼ cup	60

Second Day

				Gm.
A.M.	8:00	Cereal jelly	3 tablespoons	45
		Rich milk	2 tablespoons	30
	10:00	Milk and cream	¼ cup	60
	12:00	Rennet custard	¼ cup	60
P.M.	2:00	Milk and cream	¼ cup	60
	4:00	Rennet custard	¼ cup	60
	6:00	Cereal jelly	3 tablespoons	45
		Rich milk	2 tablespoons	30
	8:00	Milk and cream	¼ cup	60

Third Day

				Gm.
A.M.	8:00	Cereal jelly	3 tablespoons	45
		Rich milk	2 tablespoons	30
		Orange juice	1 teaspoon	5
	10:00	Milk and cream	About ½ cup	90
M.	12:00	Cream soup	About ½ cup	90
P.M.	2:00	Milk and cream	About ½ cup	90
	4:00	Rennet custard	About ½ cup	90
	6:00	Custard	About ½ cup	90
	8:00	Milk and cream	About ½ cup	90

Fourth Day

				Gm.
A.M.	8:00	Cereal jelly	¼ cup	60
		Cream	2 tablespoons	30
		Orange juice	2 teaspoons	10
	10:00	Milk and cream	About ½ cup	90
M.	12:00	Cream soup	About ½ cup	90
		Custard	3 tablespoons	45
P.M.	2:00	Milk and cream	About ½ cup	90
	4:00	Rennet custard	About ½ cup	90
	6:00	Cream soup	¼ cup	60
		Blanc mange	¼ cup	60
		Cream	2 tablespoons	30
	8:00	Milk and cream	About ½ cup	90

Fifth Day

				Gm.
A.M.	8:00	Cereal jelly	About ½ cup	90
		Cream	2 tablespoons	30
		Lactose	½ teaspoon	3
		Orange juice	1 tablespoon	15
	10:00	Milk and cream	About ½ cup	90
M.	12:00	Cream soup	¼ cup	60
		Custard	¼ cup	60
P.M.	2:00	Milk and cream	About ½ cup	90
	4:00	Milk and cream	About ½ cup	90
	6:00	Cereal jelly	¼ cup	60
		Cream	2 tablespoons	30
		Jello	¼ cup	60
	8:00	Milk and cream	About ½ cup	90

Sixth Day

				Gm.
A.M.	8:00	Cereal jelly	About ½ cup	90
		Cream	2 tablespoons	30
		Lactose	1 teaspoon	5
		Orange juice	4 teaspoons	20
	10:00	Milk and cream	½ cup	120
M.	12:00	Cream soup	¼ cup	60
		Poached egg	1	50
		Rennet custard	¼ cup	60
P.M.	4:00	Milk and cream	½ cup	120
	6:00	Milk toast:		
		Toast	1 slice	30
		Milk	½ cup	120
		Custard	About ½ cup	90
	8:00	Milk and cream	½ cup	120

Seventh Day

				Gm.
A.M.	8:00	Cereal jelly	About ½ cup	90
		Cream	2 tablespoons	30
		Sugar	1 teaspoon	5
		Toast	1½ slice	15
		Butter	½ square	5
		Orange juice	5 teaspoons	25
	10:00	Milk and cream	½ cup	120
M.	12:00	Cream soup	About ½ cup	90
		Poached egg	1	50
		Toast	1 slice	30
		Butter	1 square	10
P.M.	4:00	Milk and cream	½ cup	120
	6:00	Milk toast:		
		Toast	1 slice	30
		Milk	½ cup	120
		Custard	About ½ cup	90
	8:00	Milk and cream	½ cup	120

Eighth Day

				Gm.
A.M.	8:00	Cereal jelly	About ½ cup	90
		Cream	2 tablespoons	30
		Sugar	1 teaspoon	5
		Toast	½ slice	15
		Butter	½ square	5
		Soft-cooked egg	1	50
		Orange juice	2 tablespoons	30
	10:00	Milk and cream	½ cup	120
M.	12:00	Cream soup	About ½ cup	90
		Baked potato	1 small serving	75
		Toast	1 slice	30
		Butter	1 square	10
		Custard	About ½ cup	90
P.M.	4:00	Milk and cream	½ cup	120
	6:00	Cereal jelly	About ½ cup	90
		Cream	2 tablespoons	30
		Sugar	1 teaspoon	5
		Toast	½ slice	15
		Butter	½ square	5
		Milk	½ glass	100
	8:00	Milk and cream	½ cup	120

Ninth Day

				Gm.
A.M.	8:00	Same as eighth day with		
		Milk	½ glass	100
		Orange juice	7 teaspoons	35
	10:00	Milk and cream	½ glass	100
M.	12:00	Cream soup	About ½ cup	90
		Baked potato	1 small serving	75
		Strained applesauce	About ½ cup	90
		Toast	1 slice	30
		Butter	1 square	10
		Milk	1 glass	200
P.M.	4:00	Milk and cream	½ glass	100
	6:00	Potato, baked or mashed	1 small serving	75
		Toast	1 slice	30
		Butter	1 square	10
		Milk	½ glass	100
		Custard	About ½ cup	90
	8:00	Milk and cream	½ glass	100

Tenth Day

				Gm.
A.M.	8:00	Same as eighth day with		
		Prunes, puréed	¼ cup	60
		Orange juice	8 teaspoons	40
	10:00	Milk and cream	¾ cup	150
M.	12:00	Potato, baked or mashed	1 small serving	75
		Creamed chicken	3 tablespoons	45
		Toast	1 slice	30
		Butter	1 square	10
		Milk	¾ glass	150
P.M.	3:00	Milk and cream	¾ glass	150
	6:00	Cream soup	About ½ cup	90
		Poached egg	1	50
		Toast	1 slice	30
		Custard	About ½ cup	90
		Milk	¾ glass	150
	8:00	Milk and cream	¾ glass	150

Beginning with the eleventh day, the patient should be put on Diet 3, ambulatory, pp. 313 and 314.

Diet Following Hemorrhage from the Stomach

Following gastric hemorrhage food and drink should be withheld for from twenty-four to seventy-two hours. Complete rest, both physical and alimentary, is essential. The loss of nutrition during a short fasting period is negligible compared with the importance of overcoming shock and controlling the hemorrhage. A continuous intravenous flow of glucose, saline or hydrolysates can be administered, or an occasional transfusion may be indicated. The patient must be kept in bed and enforced rest should continue for from one to three weeks after hemorrhage has ceased. From two to three days after cessation of the hemorrhage feeding may begin. Liquid foods in very small amounts are given—from one to two ounces milk and cream mixture which is gradually increased each day until the patient is able to take amount as listed in Diet 1. Medical treatment should be started and continued as previously described.

Variation of the above procedure is followed by some clinicians. Feeding is out of the question for patients admitted in shock until they have recovered from the vascular collapse. A preliminary fast may be required if nausea is present. However, in some cases of apparent mild hemorrhage, hourly feedings may be given at once. Two ounces of albumin water or from 5 to 10 per cent solution of sweetened gelatin may be given hourly, the quantity being increased gradually to four ounces during the first twenty-four or forty-eight hours. Hard, fruit-flavored candy may be allowed to dissolve in the mouth during this period. In the absence of distention or nausea, skimmed milk is usually substituted for every other albumin feeding after twenty-four or forty-eight hours. The skimmed milk and the albumin water are soon replaced by whole milk or homogenized milk, if it is tolerated. Ordinarily, after three or four days the patient is taking from three to four ounces of milk each hour from twelve to fourteen times during the day and being given feedings during the night if awake. Fifty or 100 mg. of ascorbic acid dissolved in a little water may be added to one of the feedings each day, or the parenteral injection of 1,000 mg. of ascorbic acid daily. After the fifth day, the dietary management of the average case, irrespective of the initial method, is quite similar to Ulcer Diet 1.

SPECIAL PROCEDURES IN THE MANAGEMENT OF MASSIVE HEMORRHAGE

Most of the older diets for ulcer, such as those employed by Leube and Boas, included an initial period of fasting for approximately three days. Until recently, the preliminary fast has been employed by many clinicians in the treatment of massive hemorrhage.

Many years ago it was pointed out by both Cannon and Carlson that in the healthy animal the fasting stomach was not a resting or quiet stomach. In criticism of the fasting plan of treatment for bleeding ulcer, Alvarez and Carlson in 1936 pointed out that while efforts were directed toward not disturbing the clot, the delicate fibrin was being exposed to the "strong unbuffered gastric juice." Lenhartz, in 1904, recommended the use of frequent protein feedings in the treatment of ulcer in order to assist in the neutralization of acid and to facilitate ulcer healing. However, he was rather cautious in the administration of early feedings, using only four teaspoonfuls of milk and two teaspoonfuls of egg each hour during the first day (Table 15). Each day he increased the feedings.

Andresen departed from the preliminary starvation period in the management of peptic-ulcer hemorrhage in 1927 when he advocated the immediate feeding of a gelatin-lactose mixture (Table 16). If the author were to choose as to how to start feeding a case hemorrhaging from peptic ulcer, he would prefer a scheme similar to Andresen's rather than the Meulengracht diet for the average case. In every case, however, the hourly feedings have to be manipulated to obtain the most desirable results.

In 1934, Meulengracht first recommended the immediate use of a high caloric purée diet (Table 17) along with alkalis, antispasmodics and iron in the treatment of ulcer hemorrhage. He employed a teaspoonful of equal parts of sodium bicarbonate and magnesium subcarbonate with a small amount of the extract of hyoscyamus three times a day, together with small doses of iron. At 6 A.M. the patients are allowed tea and white bread and butter. At 9 A.M. they are given porridge with milk and bread and butter. At noon, the dinner is selected from the following list: Vegetable or cream of vegetable soup, meat balls, fish balls, timbale, broiled lamb chops, meat au gratin, fish au gratin, omelet, mashed potatoes, vegetable purée, stewed apricots, applesauce and puddings. Cocoa is allowed at 3 P.M.,

TABLE 15

LENHARTZ DIET AS MODIFIED BY LAMBERT*

Day	Eggs	Milk	Sugar	Scraped Beef
1	2 drams each dose; total, 2 eggs	4 drams each dose; total, 6 oz.		
2	3 drams per dose; total, 3 eggs	6 drams per dose; total, 10 oz.		
3	½ oz. per dose; total, 4 eggs	1 oz. per dose; total, 13 oz.	20 Gm. added to eggs	
4	5 drams per dose; total, 5 eggs	1½ oz. per dose; total, 1 pt.	20 Gm. added to eggs	
5	6 drams per dose; total, 6 eggs	14 drams per dose; total, 19 oz.	30 Gm.	
6	7 drams per dose; total, 7 eggs	2 oz. per dose; total, 22 oz.	40 Gm.	36 Gm. in 3 doses
7	4 drams per dose; total, 4 eggs; also 1 soft-boiled egg every 4 hours; total, 4 eggs	2 oz. per dose; total, 25 oz.	40 Gm.	70 Gm. with boiled rice; 100 Gm. in 3 doses
8	4 drams per dose; total, 4 eggs; also 1 soft-boiled egg every 4 hours; total, 4 eggs	1½ oz. per dose; total, 28 oz.	40 Gm.	70 Gm. with boiled rice; 100 Gm. in 8 doses
9	....	3 oz. per dose; total, 1 qt.	....	Beef same; rice, 200 Gm.; zwieback, 40 Gm., in 2 portions
10	4 drams per dose; total, 4 eggs, also 1 soft-boiled egg every 4 hours; total, 4 eggs	Add cooked chopped chicken, 50 Gm.; also butter, 20 Gm.	40 Gm.	Beef same; rice, 200 Gm.; zwieback, 40 Gm., in 2 portions

11 and 12. Interval of feeding made two hours; milk given in 6-oz. doses with ½ oz. raw egg; butter increased to 40 Gm., and various additions made as detailed above.

* From Friedenwald and Ruhräh.

TABLE 16

LONG ISLAND COLLEGE HOSPITAL DIET FOR PATIENTS WITH GASTRIC HEMORRHAGE*

Character of Feedings		oz.	Gm.	Calories
Gelatin solution	Gelatin	1	30	128.0
	Lactose	3	90	360.0
	Juice of 1 orange			47.8
	Water	32	1,000	
Gruel mixture 1	Cereal gruel (oatmeal, barley or cornmeal)	16	500	338.5
	Milk	14	420	290.8
	Cream	4	120	458.9
	Lactose	3	90	360.0
Gruel mixture 2	Cereal gruel (same)	12	350	227.5
	Milk	32	1,000	692.0
	Cream	4	120	458.9
	Lactose	4	120	480.0

Schedule of Feedings

		oz.	Total Calories
First and second day; feed every 1½ hours	Gelatin sol.	4	947.2
Third day; feed every 1½ hours	Gelatin sol.	4	
	Gruel 1	5	1,365.4
Fourth day; feed every 1½ hours	Gelatin sol.	5	
	Gruel 1	5	1,499.3
Fifth and sixth day; feed every 1½ hours	Gelatin sol.	6	
	Gruel 2**	6	3,600.0
Seventh and eighth day; feed every 2 hours	Gelatin sol.	6	
	Gruel 2**	6	3,600.0
Ninth day and thereafter	Long Island College Hospital diet for patients with ulcer		

* From La Due: J.A.M.A. **113**:375.

** Add to gruel mixture at each feeding one of the following: 3 oz. cereal, 1 soft poached egg, custard or jello.

and at 6 P.M. the meal consists of white bread and butter, meat, cheese and cream. The patients are permitted to eat as much as they like. Milk is allowed between meals as desired.

Available statistics do not justify a comparison of the mortality of patients treated by the more conservative method and those treated by early feedings.

The Sippy type of management or its modification with hourly feedings of milk and the addition of alkalis and vagus depressant drugs produces rapid healing of most gastric and duodenal ulcers. Long starvation is not desirable for the average patient with massive hemorrhage. However, there are cases in which any type of feeding will induce vomiting, and it is certainly impossible to treat the patient with a severe, active hemorrhage who is admitted in shock by any type of dietary management until the emergency has passed. Obviously each patient is an individual problem and should be treated accordingly. The principal disadvantages of any feeding method in hemorrhage cases, whether it be the Lenhartz, the Andresen or the Meulengracht method or any of their modifications, is that clinicians inexperienced in ulcer management

TABLE 17

MEULENGRACHT DIET

First Day:		
A.M.	6:00	White bread and butter, tea
	9:00	Oatmeal with milk, white bread and butter
P.M.	1:00	Puréed vegetable (peas, carrots), mashed potato, tea, white bread and butter
	3:00	Cocoa or tea
	6:00	Mashed potato, puréed vegetable, custard, white bread and butter, tea
Second Day and Thereafter:		
A.M.	6:00	Tea, white bread and butter
	9:00	Oatmeal with milk, white bread and butter
P.M.	1:00	Cream of vegetable soup (peas, potatoes, carrots, string beans, asparagus), boiled or mashed potatoes, puréed vegetables (peas, carrots, asparagus), cooked strained fruit, plain rice or tapioca pudding, junket, jello, plain milk pudding, chocolate cornstarch, white bread and butter, tea
	3:00	Cocoa or tea
	6:00	Cream cheese or eggs (soft-boiled or poached), boiled or mashed potatoes, or cereal with milk and sugar
	6:00	Puréed vegetables, dessert from above list, white bread and butter

and incapable of an accurate and rapid estimate of the degree of the hemorrhage may employ a feeding method routinely. It is probable that recurrent, gross bleeding has followed and will continue to follow the use of any radical feeding method of treating patients who are seriously ill with massive hemorrhage.

Diseases of the Digestive Tract *(Continued)*

CONSTIPATION

Nature of the Ailment

Delay in the passage of the contents of the colon

Object of Diet

To promote normal passage of the contents of the colon

Constipation is probably one of the most prevalent difficulties of modern life. It is interesting to consider what constitutes constipation. The condition may be manifested in three ways: (1) Defecation may occur with insufficient frequency; (2) the stools may be inadequate in amount; (3) the stools may be abnormally hard and dry. Some physicians are of the opinion that two or three evacuations daily are necessary for health, while others stress the view that many normal persons have only one evacuation every two or three days. There are decided individual differences in this respect. The normal limits of evacuation, then, may vary from three stools in one day to one stool in three days. A misunderstanding of this normal variation in different individuals and efforts to promote routinely an evacuation every day may do more harm than good. Especially is this true when the patient is obsessed with the idea of daily bowel movements and resorts to cathartics or enemas to promote them. The endeavor should be to secure bowel movements under normal conditions with whatever frequency and in whatever amount and consistency will give the individual the most comfort, and no person need consider himself constipated provided this end is attained.

Important Factors in Dietary Treatment of Constipation

1. Bulk and consistency
2. Lubrication
3. Presence of substances which stimulate peristalsis

These factors are now discussed briefly.

Bulk and Consistency. Proper bulk and consistency serve to stimulate the intestine to active muscular movements and to make for better promotion of the contents of the colon. The contents should be semisolid, nonirritating and relatively free of undigested food residues. The diet must contain an abundance of high-residue or cellulose-rich foods, which necessitates the eating of plenty of fruits and vegetables, especially fibrous and leafy vegetables, as well as coarse breads and cereals. Such foods give bulk to the fecal material. Plenty of water and foods producing slight fermentation tend to break up the fecal mass by the formation of fermentation, which favors a soft, bulky intestinal content. Without adequate roughage and water the stool may become hard and dry, and it may be difficult to promote passage by stimulating peristalsis due to the small bulk of the residue.

Dried fruits, either cooked or raw, spinach, cabbage, cauliflower, beet greens, lettuce and other salad vegetables are all excellent foods to produce bulk.

Bran may be used, but caution is needed with regard to roughage, since there is danger of overdoing the effort to furnish bulk. Forcing too much bulk and roughage may result in irritating the colon, especially in the spastic type, and diarrhea may develop.

Lubrication. Lubrication between the fecal material and the intestinal wall is developed by the presence of extra liquid or of undigested fat. Fats in considerable quantities are desirable; they are best taken in cream, butter, bacon and salad dressings.

Presence of Substances Which Stimulate Peristalsis. Substances which stimulate peristalsis are needed in cases which require increased muscular activity of the colon. This condition may be produced either mechanically or chemically; for example, it is produced by the harsh, irritating substances of bulky undigested food residues and fruits with their acids and salts. Such foods as cider, sauerkraut and the like furnish chemical stimulants to peristalsis of the bowel and in many instances act as a laxative.

Not only does the average American tend to eat a soft, pasty diet of highly refined foods, such as sugar, cereals, white bread and pastry, potato and meat, with a residue conducive to constipation, but the habits and the hygiene of living are unfavorable for securing normal bowel movements.

In addition to the important dietary factors influencing constipation, the daily life of the individual must be taken into consideration. There should be plenty of fresh air and sunshine. Adequate exercise with efforts to attain a correct posture aids in developing good tone of intestinal muscles, which in turn favors digestive and nervous stability. Plenty of sleep and rest with an effort to avoid the hurry, the worry and the strain of the machine age, regular meals, fairly even in amount, and the habit of a regular time of going to the toilet for an evacuation, all are very important adjuncts to the diet procedures.

TYPES OF CONSTIPATION

There are two main types of constipation; they are usually described as the atonic and the spastic.

Atonic Type. The type of constipation which is by far the more common is the atonic. This is generally due to an insufficiency in the peristaltic movements of the bowel, which may in turn be due to muscle weakness or lowered reflex sensibility to stimuli or to feces which are of such consistency as to promote difficulty in passage.

Spastic Type. The spastic type of constipation is a condition in which the circular muscle fibers of the intestine are stimulated to contract. The cause is either irritation of the mucosa or the hypersensitive nervous susceptibility of the individual. The result is small, hard fecal masses or thin ribbon- or finger-like stools. Mucus or mucomembranous shreds are often associated with the stool. Individuals with this type of stool are generally neurotic in temperament.

It is comparatively easy in certain individuals to obtain regular daily bowel movements simply by emphasizing the proper health habits and exercise and by giving a normal adequate diet which is rich in fruits and in vegetables. The extent to which roughage will have to be incorporated is dependent entirely on the type of constipation and the individual's reaction. Some measures may benefit one individual and actually disturb another of a different type and constitution.

In the general application of dietotherapy in constipation of either type, as soon as the conditions lacking for normal bowel movement have been corrected and the promotion of normal evacuation has been accomplished, a normal type of diet can be reverted to gradually to suit the individual case.

For atonic constipation, which is the usual type, the use of a bulky, stimulating diet is indicated. We have outlined the typical foods which are allowed and which are to be avoided, and in addition have presented four diets of 1,400, 1,800, 2,200 and 2,600 calories, any one of which may be used, depending upon the caloric needs of the individual.

All the important factors outlined are incorporated.

In cases of spastic constipation characterized by more or less spasm of the bowel, the colon may be irritable. Special care has been taken to avoid foods that might increase this irritability, which in turn would be likely to increase the spasm. In these cases, we aim to use a bland, nonirritating diet. A special list of typical foods which are allowed and which are to be avoided, with the presentation of four suggested diets of 1,400, 1,800, 2,200 and 2,600 calories, is outlined for this classification.

Typical foods to be emphasized in the treatment of the atonic type of constipation:

Whole-grain cereals:
- Oatmeal
- Wheatena
- Cracked wheat
- Wheatsworth
- Puffed wheat
- Shredded wheat
- Graham mush
- Wild rice

Whole-grain breads:
- Whole-wheat bread
- Rye bread made from the whole-grain rye flour
- Cracked-wheat bread

Vegetables, especially fibrous and leafy ones:
- Cabbage
- Celery
- Cauliflower
- String bean
- Spinach
- Beet greens
- Lettuce and other salad vegetables
- Fruits of all kinds, especially those that may be eaten with skins

Typical foods to be avoided in the treatment of the atonic type of constipation:

Sugar

Highly milled cereals:
- Cream of wheat
- Farina
- Corn flakes
- Cornmeal mush
- Grapenuts
- Hominy
- Pearled barley
- Puffed rice
- White rice

Concentrated foods:
- Pastry
- Pie
- Rich cakes
- Fried, greasy foods

Indigestible substances which may be taken in prescribed amounts with food:

Bran

Sea weeds:
- Agar agar
- Irish moss

Paraffin preparations and mineral oil

These indigestible substances should be used only as an emergency or as a corrective measure, and not routinely. If the diet contains plenty of coarse cereals, coarse breads and fruits and an abundance of fibrous and leafy vegetables, there should be sufficient residue to provide proper elimination.

Atonic Type

---

60 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 110, Protein 60, Fat 80, Calories 1,400

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread (whole-grain)	60	3 thin slices
Butter	25	2½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	75	1 serving (2½ oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	400	4 servings
Fruit, 10% Fruit, 15%	300	3 servings
Vegetables and fruit, 20%		

Atonic Type

60 Gm. Protein
1,400 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	2 slices	10
Egg	1	50
Bread (whole-grain)	1 thin slice	20
Butter	½ square	5
Cream, 20%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Egg or egg substitute	1	50
Vegetables, 3% or 6%	2 servings	200
Bread (whole-grain)	1 thin slice	20
Butter	1 square	10
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Meat	1 serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3% or 6%	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	1 square	10
Milk	1 glass	200
Fruit	1 serving	100

Atonic Type

---

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 135, Protein 60, Fat 115, Calories 1,815

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread (whole-grain)	90	3 slices
Butter	55	5½ squares
Salad dressing with oil	15	1 tablespoon
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	400	4 servings
Fruit, 10% Fruit, 15%	300	3 servings
Potato or substitute*	75	1 small serving

* Potato substitutes, page 81.

Atonic Type

60 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	2 slices	10
Egg	1	50
Bread (whole-grain)	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Clear soup if desired		
Egg or egg substitute*	1	50
Vegetable, 3% or 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 3% or 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	2½ squares	25
Milk	1 glass	200
Fruit	1 serving	100

* Egg substitutes, page 81.

Atonic Type

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 195, Protein 60, Fat 130, Calories 2,190

Food	*Gram Weight*	*Household Measure*
Cereal (whole-grain, cooked)	140	⅔ cup
Bread (whole-grain)	90	3 slices
Butter	50	5 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3% Vegetables, 6%	400	4 servings
Fruit, 10% Fruit, 15% Fruit, 20%	300	3 servings
Potato or substitute	75	1 small serving
Sugar	10	2 teaspoons
Dessert	100	1 serving

Atonic Type

60 Gm. Protein
2,200 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (whole-grain, cooked)	⅔ cup	140
Bacon	2 slices	10
Egg	1	50
Bread (whole-grain)	1 slice	30
Butter	1 square	10
Sugar	2 teaspoons	10
Cream, 20%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Clear soup*		
Potato or substitute	1 small serving	75
Vegetable, 3% or 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Fruit cocktail	1 serving	100
Meat	1 serving	60
Vegetable, 3% or 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Dessert	1 serving	100

* Clear soup as often as desired.

Atonic Type

---

60 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 200, Protein 60, Fat 175, Calories 2,615

Food	*Gram Weight*	*Household Measure*
Cereal (whole-grain, cooked)	140	⅔ cup
Bread (whole-grain)	90	3 slices
Butter	90	9 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	120	½ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices
Egg	50	1
Vegetables, 3% Vegetables, 6%	400	4 servings (2 cups)
Fruit, 10% Fruit, 15% Fruit, 20%	300	3 servings
Potato or substitute	100	1 serving
Sugar	10	2 teaspoons
Dessert	100	1 serving

Atonic Type

60 Gm. Protein
2,600 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (whole-grain, cooked)	⅔ cup	140
Bacon	2 slices	10
Egg	1	50
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Sugar	2 teaspoons	10
Cream, 20%	½ cup	120
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Potato or substitute	1 serving	100
Vegetable, 3% or 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	3½ squares	35
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Fruit cocktail	1 serving	100
Meat	1 serving	60
Vegetable, 3% or 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	3½ squares	35
Milk	1 glass	200
Dessert	1 serving	100

Typical Foods Allowed in the Treatment of the Spastic Type of Constipation

Cereal:
- Oatmeal
- Cream of wheat
- Farina
- Breakfast brownies
- Ralston
- Rice
- Corn flakes
- Puffed rice
- Puffed wheat
- Rice Krispies
- Rice flakes

Bread:
- White
- Graham

Egg:
- Soft-cooked
- Poached
- Soufflé
- Baked omelet

Cheese:
- Cottage cheese
- Soft cream cheese

Meat:
- Chicken
- Fish
- Lamb
- Liver
- Scraped beef
- Sweetbreads
- Oyster
- Bacon

Potato:
- Boiled
- Creamed
- Scalloped (with toast crumbs)
- Mashed
- Baked

Vegetables:
- Carrot
- Squash
- Beet
- Pea
- Tender lettuce
- Spinach
- String bean
- Asparagus
- Cauliflower
- Strained tomato

Fruits—cooked without skins and seeds:
- Apple
- Prune
- Peach
- Pear
- Apricot
- White cherry
- Banana

Fruits—raw:
- Ripe banana
- Ripe pear
- Orange juice

Desserts:
- Gelatin:
  - Bavarian cream made from juices of fruit listed above
- Ices and ice cream
- Puddings:
  - Rice
  - Tapioca
  - Prune whip
  - Graham whip
  - Blanc mange
  - Grape sponge
- Cake:
  - Sponge
  - Angel food
  - Hard sugar cookies

Beverages:
- Coffee substitutes:
  - Kaffee Hag
  - Sanka coffee
  - Postum
- Milk

Condiments:
- Salt

Typical Foods to Be Avoided in the Treatment of the Spastic Type of Constipation

- Coarse cereals and breads
- Coarse vegetables and fruits
- Concentrated acid fruits and vegetables
- Raw fruit and vegetables
- Pork, veal, salmon, sardine
- All fried or greasy foods
- Spices and condiments other than salt
- Coffee, strong tea

Spastic Type

60 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 110, Protein 60, Fat 80, Calories 1,400

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	60	3 thin slices
Butter	25	2½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	75	1 serving (2½ oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, orange juice	100	½ glass
Fruit, 15%	200	2 servings
Fruit, 20%		

Spastic Type

60 Gm. Protein
1,400 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Orange juice	½ glass	100
Bacon	2 slices, crisp	10
Egg	1	50
Bread	1 thin slice	20
Butter	½ square	5
Cream, 20%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Egg or egg substitute	1	50
Vegetables	1 serving	100
Bread	1 thin slice	20
Butter	1 square	10
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Meat	1 serving	75
Vegetables	2 servings	200
Bread	1 thin slice	20
Butter	1 square	10
Milk	1 glass	200
Fruit	1 serving	100

Spastic Type

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 145, Protein 60, Fat 110, Calories 1,810

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	90	3 slices
Butter	65	6½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, orange juice	100	½ glass
Fruit, 15%, 20%	200	2 servings
Potato or substitute	75	1 small serving
Sugar	5	1 teaspoon

Spastic Type

60 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Orange juice	½ glass	100
Bacon	2 slices	10
Egg	1	50
Bread	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 teaspoon	5
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Egg or egg substitute	1	50
Vegetables	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetables	2 servings	200
Bread	1 slice	30
Butter	2½ squares	25
Milk	1 glass	200
Fruit	1 serving	100

Spastic Type

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 200, Protein 60, Fat 130, Calories 2,210

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	65	6½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	120	½ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, orange juice	100	½ glass
Fruit, 15%, 20%	200	2 servings
Potato or substitute	75	1 small serving
Sugar	10	2 teaspoons
Dessert	100	1 serving

Spastic Type

60 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Orange juice	½ glass	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices, crisp	10
Egg	1	50
Bread	1 slice	30
Butter	2 squares	20
Sugar	2 teaspoons	10
Cream, 20%	½ cup	120
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Potato or substitute	1 small serving	75
Vegetables	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Fruit cocktail	1 serving	100
Meat	1 serving	60
Vegetables	2 servings	200
Bread	1 slice	30
Butter	2½ squares	25
Milk	1 glass	200
Dessert	1 serving	100

Spastic Type

60 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 200, Protein 60, Fat 175, Calories 2,615

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	105	10½ squares
Salad dressing with oil		
Milk	300	1½ glasses
Cream, 20%	200	1 glass
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, orange juice	100	½ glass
Fruit, 15%, 20%	200	2 servings
Potato or substitute	100	1 serving
Sugar	10	2 teaspoons
Dessert	100	1 serving

Spastic Type

60 Gm. Protein
2,600 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Orange juice	½ glass	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices, crisp	10
Egg	1	50
Bread	1 slice	30
Butter	2½ squares	25
Cream, 20%	½ glass	100
Sugar	2 teaspoons	10
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Potato or potato substitute	1 serving	100
Vegetables	1 serving	100
Bread	1 slice	30
Butter	4 squares	40
Milk	¾ glass	150
Cream, 20%	¼ glass	50
Fruit	1 serving	100
DINNER		
Fruit cocktail	1 serving	100
Meat	1 serving	60
Vegetables	2 servings	200
Bread	1 slice	30
Butter	4 squares	40
Milk	¾ glass	150
Cream	¼ glass	50
Dessert	1 serving	100

Deficiency Diseases

Nature of Disease

Condition resulting from lack of one or more food elements

Object of Diet

Adequate diet high in the deficient elements

Deficiency disease is a term that was applied primarily to the results obtained in feeding experiments on animals by the lack of one or more vitamins. Similar conditions, such as xerophthalmia, beriberi, scurvy, rickets and pellagra, have been observed in man with vitamin deficiency. However, the term deficiency disease should include in its scope not only vitamin deficiencies but those conditions in which one or more of the other food elements, such as protein, fats and minerals, may be lacking.

Food Deficiencies and Chronic Disease. The average diet is not deficient in one factor alone; there may be several slight food deficiencies which after a long period of time may be responsible for various degrees of nutritional disturbances without an associated syndrome of any definite malady. The influence of food deficiencies on chronic disease is just beginning to be appreciated. Some of the findings that are suggestive of possible food deficiencies are the unexplained anemias, emaciation or undernutrition without organic disease, indeterminate gastro-intestinal symptoms or unexplained diarrhea, an edema without cardiovascular renal disease, peripheral neuritis with disorders of sensation, skin lesions of obscure cause. Any of these factors may be the result of either the accidental or the slight omission of the adequate and protective foods of a normal diet or of prolonged one-sided diets improperly followed or outlined, such as may be used in peptic ulcer, gastro-intestinal disorders, nephritis, epilepsy and other conditions.

Because of faulty habits of living in the present machine age and recent trends in modern dietary habits, the nutritional condition and the physical vigor of the nation have unquestionably deteriorated. The average physician, therefore, is interested in proper and adequate nutrition not so much because of its relation to beriberi, scurvy and xerophthalmia—all of which are rarely if ever seen by him—but because of the poorly defined states of ill-health that may result from food deficiencies.

For the sake of simplicity, deficiency diseases are discussed as though they were associated with a single vitamin; for example, beriberi with thiamine, pellagra with niacin, scurvy with ascorbic acid. This may give the impression that such diseases are due to lack of a single vitamin. This is not so. With the possible exception of rickets, deficiency diseases are due to multiple deficiencies and ordinarily not to deficiency of a single factor. We do not know the precise role played by lack of protein, essential amino acids and minerals in deficiency diseases such as beriberi and pellagra,

Deficiency Disease	Important Factor in Dietary Treatment
Xerophthalmia, night blindness	Vitamin A
Beriberi and certain forms of peripheral polyneuritis	Vitamin B_1 (thiamine chloride)
Pellagra	Nicotinic acid (niacin)
Ariboflavinosis	Riboflavin
Scurvy	Vitamin C (ascorbic acid)
Rickets	Vitamin D, calcium and phosphorus
Tetany	Calcium, vitamin D
Osteomalacia	Protein, calcium, phosphorus, vitamins A and D
Spasmophilia	Calcium, vitamin D
Hypovitaminosis E	Vitamin E (tocopherol)
Hemorrhagic diseases of the newborn	Vitamin K
Hypoprothrombinemia	Vitamin K
Nutritional edema	Protein
Simple goiter	Iodine
Macrocytic anemias	Folic acid and liver
Related macrocytic anemias	Folic acid and liver
Pernicious anemia	Liver and folic acid
Sprue	High protein, low carbohydrate, low fat, folic acid
Hypochromic, microcytic anemia	Iron

All the deficiency diseases listed above and the important factors in their treatment will be discussed briefly.

nor do we know the complete interrelationship between vitamins and other essential food factors.

There are many books with long descriptions of the various dietary deficiency diseases and of the brilliant experimental evidence upon which the newer knowledge of nutrition is based. This is beyond our purpose. We have outlined above the deficiency diseases, calling attention to the important factors in dietary treatment of each one, and will discuss them briefly.

XEROPHTHALMIA, NIGHT BLINDNESS

The earliest detectable result of a lack of vitamin A on the eyes is a slight impairment of dark adaptation. Few patients with night blindness are sufficiently observant to realize that their twilight vision is better in the early morning than in the evening. The first change in the eye which can be observed clinically is a drying or xerosis of the eye known as xerophthalmia, which is generally accompanied by photophobia. In the Philippines, nearly one third of the children attending a hospital have xerophthalmia. In the Dutch East Indies, with the child population at half a million, nearly 4,000 children between the ages of twenty-one months and fifteen years were blind, apparently from lack of vitamin A. The treatment or prevention of such factors is by the use of substances rich in vitamin A, such as cod-liver oil, halibut-liver oil, butter, cream, whole milk, egg yolk and plenty of green vegetables.

BERIBERI AND CERTAIN FORMS OF PERIPHERAL POLYNEURITIS

Many mild clinical cases of vitamin B_1 deficiency have escaped notice because clinicians wait for the appearance of full-blown beriberi or peripheral polyneuritis before diagnosing it. Patients with complaints resembling neurasthenia or chronic nervous exhaustion should be suspected of having a deficiency of thiamine or of the vitamin B complex. Special attention should be paid to such neurologic manifestations as tenderness of the calf muscles on squeezing, hyperthesia, anesthesia over the anterior surface of the tibia, muscle cramps and muscular weakness, which appear before the more serious neurologic complications. Diminished ankle or knee jerks and loss of vibration sense may also be observed. Anorexia, fatigue, dyspnea on exertion, loss of weight and irritability may be early accompanying symptoms. The incidence of beriberi is greatest in those regions in which polished rice and refined cereals form the bulk of the diet. Rice is a staple foodstuff of half the human race, and in India, from 80 to 90 per cent of the total calories are supplied by rice. To provide sufficient vitamins, the rice must be supplemented with maize, legumes or fish. When the supply of these fails, the incidence of beriberi increases. It is endemic in Japan, southern China, the Philippines, the East Indies, the Malay Peninsula and southern India. It has been generally supposed that beriberi is a deficiency disease due to the lack of thiamine. However, deficiency diseases are never limited to the lack of a single factor. Although there is a lack of thiamine in beriberi, the disease is undoubtedly a multiple deficiency syndrome. Because the edema and the cardiovascular symptoms of beriberi respond dramatically to pure thiamine, it has been argued that beriberi is a disease specifically associated with the deficiency of this vitamin. The adult or chronic type of beriberi, in contrast with the infantile, is usually insidious in onset, except in cases of acute cardiac beriberi. Clinically, the disease is characterized by a triad of symptoms—cardiovascular disturbances, neuritis and edema. The various forms are termed dry (neuritic, paraplegic), wet or cardiac, according to the prevailing symptoms. Neuritis is perhaps the most constant finding, although cardiac symptoms may be present. Early complaints are a feeling of fatigue, heaviness and stiffness of the legs with areas of paresthesia and tenderness along the nerve tracks. Soon after, the patient may notice headache, insomnia, anorexia, dyspnea, tachycardia, nervousness and tenderness of the calf muscles on squeezing.

There are a certain number of conditions in which polyneuritis, when it occurs, is directly related to defective nutrition and may be nutritional or metabolic neuritis. The better-known conditions of this type are alcoholism, pernicious anemia, sprue, polyneuritis of pregnancy, neuritis of diabetes, that associated with malignant disease, tuberculosis, and the polyneuritis of beriberi and pellagra.

In an effort to prevent any of the symptoms of thiamine deficiency, a well-balanced diet, so-called high vitamin diet, pages 352 to 359, is all that is required. Foods rich in thiamine and the B complex, such as whole-grain cereal peas, beans, lentils, ground peanuts and yeast or yeast extracts, are useful adjuncts to the diet. Particular attention should be directed toward the diet of persons with chronic debilitating diseases and increased metabolisms. The incidence of beriberi is higher among such people. Chronic alcoholism, pellagra sprue, senility, cirrhosis, tuberculosis and malignant disease, among others, in terfere with the proper nutrition of the patient and predispose toward a vitamin deficiency.

The treatment of beriberi will depend upon the severity of the condition. In cases of severe or acute cardiac beriberi, from 20 to 100 mg. of thiamine may be given daily parenterally—intravenously if need be. Smaller doses repeated several times daily can be given instead. When the heart and the circulation return to normal, the dose can be reduced to from 5 to 10 mg. daily parenterally, and if there is no sign of gastro-intestinal upset, this can finally be replaced by from 5 to 6 mg. daily by mouth. In cases of peripheral polyneuritis, up to 100 mg. thiamine parenterally, plus a good concentrate of vitamin B complex, may be given. The diet should contain whole grains, legumes, leafy vegetables or fruits, meat, eggs and fresh milk.

PELLAGRA

Clinical Signs and Symptoms. It is apparent from the study of a number of pellagrins that there is a long prodromal period of ill-health with insidiously advancing symptoms which at first appear trivial but gradually increase in intensity. Loss of weight, strength and appetite, insomnia, vertigo, headache, dyspepsia, anorexia, sore tongue and mouth, and constipation or diarrhea are common prodromal symptoms and appear without obvious cause. Irritability, loss of memory and depression may be complained of. Other early symptoms include abdominal pain, nervousness, palpitation, inability to concentrate and mental confusion. The earliest symptoms are dizziness on rising, pains in the limbs and vague alimentary symptoms. The early syndrome presents no uniform clinical picture, and often in the early stages a diagnosis of neurasthenia may be made. The diagnosis of preclinical pellagra can be made if these symptoms appear in those with grossly inadequate nutrition, in those suffering from gastro-intestinal disease or in those who have undergone surgery of the gastro-intestinal tract; or if they appear in those whose vitamin requirements have been increased by pregnancy, lactation, infection, diseases of the thyroid or increased physical exertion and the increased needs of vitamins have not been met. More than half of all severe cases have a macrocytic, hyperchromic anemia, and a number show achlorhydria. Pellagra may present no clear-cut clinical picture, but the following cardinal manifestations, gastro-intestinal symptoms, skin lesions and mental symptoms are generally present.

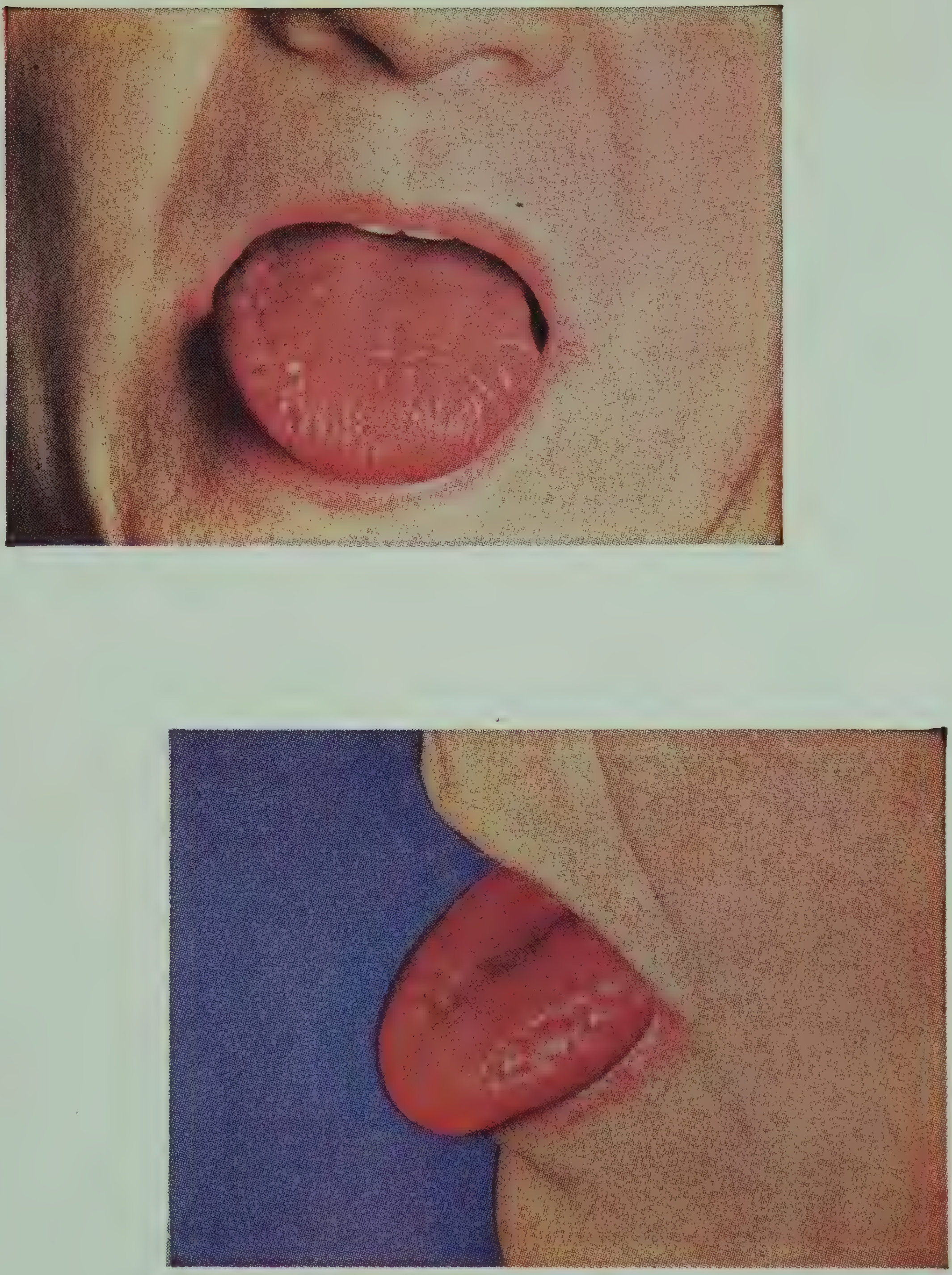
Gastro-intestinal Symptoms. Gastro-intestinal symptoms usually precede the mental symptoms and the skin lesions. Loss of appetite, nausea, indigestion, vomiting, abdominal pain and constipation or diarrhea are early complaints. Glossitis and stomatitis are among the first symptoms. The tongue is red, beefsteak in color (Plate 11), first at the tip and the edges, and later the entire tongue is denuded of superficial epithelium and papillae. It is painful and inflamed, as in sprue. Often there are areas of superficial ulceration of the mucous membrane of the tongue and the mouth, and smears from these areas may reveal large numbers of Vincent's organisms. The mouth may be so painful that the patient refuses food. Highly seasoned food or hot drinks may produce a scalding sensation in the mouth. Difficulty in swallowing and vomiting may be serious. About one half of the pellagrins have achlorhydria even after histamine stimulation. Pellagra often commences with constipation, but later diarrhea becomes a prominent symptom, although it is by no means a constant one, even in severe pellagra. When chronic diarrhea occurs, it is a very distressing symptom. The patient may pass from three to thirty stools a day. These stools are profuse, watery, foul and gaseous, sometimes even resembling those of sprue, but they do not have the fatty acid content of sprue. Proctoscopy shows a general inflammation of the mucous membrane, accompanied by a burning sensation in the rectum.

Skin Lesions. The skin lesions of pellagra are usually bilaterally symmetrical and they are sharply demarcated from the adjacent healthy skin. They are distributed on the face, the neck, the dorsal surfaces of the hands and lower forearm, the elbows, the dorsum of the feet and lower legs in barefooted persons. There may also be patches over the sternum, the scrotum, the labia, the anus and other regions subjected to mechanical irritation of the action of body secretions. The dermatitis of pellagra has a characteristic appearance and is distributed in those parts of the body subject to exposure and mild trauma due to tight clothing. The lesions are precipitated by exposure to sunlight, fires and radiant heat. At first the skin lesions are erythematous and resemble sunburn, but later they change to a reddish-brown color. The underlying skin is thickened and an exfoliative desquamation may ultimately develop. Permanent pigmentation may develop in pellagrins who have been subject to repeated occurrences of dermatitis. Hyperkeratosis with callous formation is characteristic and may precede the exfoliating dermatitis and other manifestations of pellagra. The genital and the anal regions are often affected and may be involved at the same time as those of the tongue and the mouth.

Mental Symptoms. Mental symptoms develop in from one third to one quarter of the cases of pellagra. The symptoms are exceedingly variable—from the common feeling of tenseness, irritability, mental depression, emotional instability and weeping without cause to the confused states with hallucinations, mania and delirium. Insomnia is frequent with melancholia, lethargy and stupor. Mental symptoms are particularly amenable to nicotinic-acid therapy.

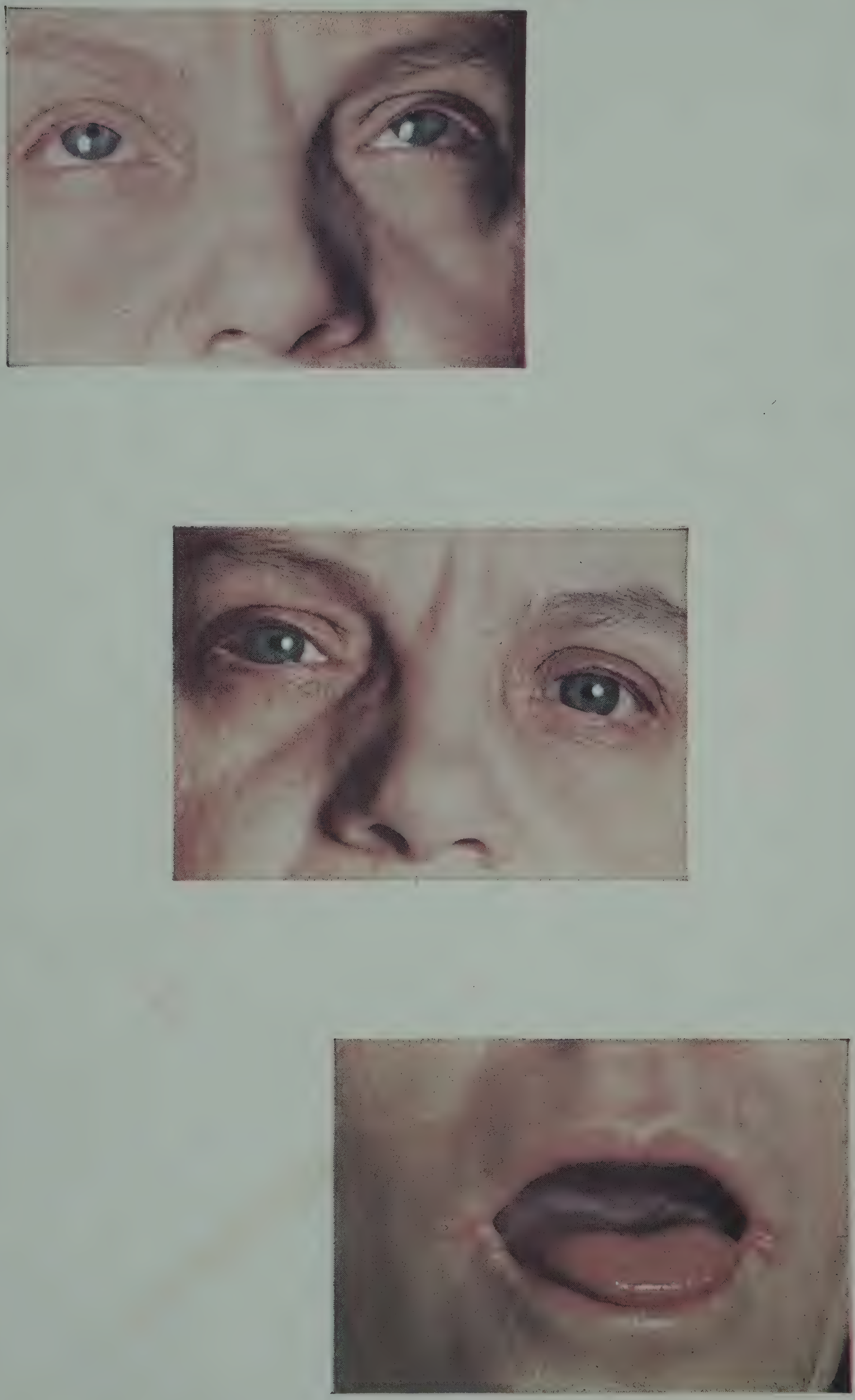
Treatment. Nicotinic acid, sodium nicotinate or nicotinamide relieve the acute mental symptoms in dramatic fashion and also improve the alimentary tract and skin lesions, but they have little effect on the neuropathy or on the lesions of lips and face, which respond to thiamine, riboflavin and the vitamin B complex. Nicotinamide has an advantage over nicotinic acid in that it does not produce vasodilitation of the skin, flushing, itching and other reactions. The dosage of nicotinamide is the same as that of nicotinic acid. Patients with mild or subclinical pellagra recover rapidly on a diet containing adequate quantities of nicotinic acid and other members of the vitamin B complex. Plenty of red meat, meat extracts, liver, eggs, fresh vegetables, milk and yeast extract or Brewer's yeast should be incorporated in the diet. Small doses of nicotinic acid, from 25 to 50 mg. two or three times daily after meals, are helpful. The cases of moderately severe pellagra should be confined to bed until the skin lesions have disappeared, and the same general and dietary treatment as described for the mild cases should be followed. Nicotinic acid or its amide is given in doses of 100 mg. three times a day after food. The other members of the vitmin B complex are best administered in the form of yeast, from 1 to 6 oz. daily, or liver concentrates. Crude-liver

PLATE 11



Tongue of nicotinic-acid deficiency. (*Top*) Superficial ulcerations of tongue and healed fissures at angles of mouth indicate previous ariboflavinosis. (*Bottom*) Glossitis, red beefsteak tongue.

PLATE 12



(*Top*) Ocular manifestations of ariboflavinosis. Conjunctivitis and photophobia. (*Center*) The same patient after two-days' treatment with riboflavin. (*Bottom*) Tongue of riboflavin deficiency. Magenta or purplish color, cheilosis (fissures at angles of mouth).

concentrates are given in doses of one tablespoonful three times daily. After recovery, the doses of nicotinic acid are reduced to a maintenance dose of 50 mg. once daily. Severely ill patients should be hospitalized and treated as emergencies, because they may collapse and die within a day or so. Diarrhea and dementia are often present, so that normal feeding has to be abandoned at first. Patients are usually dehydrated from the diarrhea and the associated glossitis, dysphagia, anorexia and vomiting; this prevents the ingestion of food. Patients are given intravenous infusions of 5 per cent glucose in normal saline in doses of from 500 to 1,000 cc. two and three times daily for the first day or so. These may be continued if the patient cannot take fluid by mouth or has severe diarrhea. Glucose drip may be added to the saline—100 mg. of thiamine, 50 mg. of riboflavin and 200 mg. of vitamin C. Intravenous therapy is continued until the diarrhea and the vomiting have subsided. Patients are then given a liquid diet supplemented by from 300 to 500 mg. of nicotinic acid daily; yeast, meat extracts and liver extracts; and thiamine and riboflavin in the doses mentioned. If nicotinic acid is tolerated by mouth and there is no severe diarrhea, from 300 to 500 mg. daily are given orally for a week in divided doses. In from one to three days of beginning treatment, the fiery tongue and the soreness of anus and vagina subside. The skin lesions begin to change and the acute mental manifestations often vanish overnight. The papillae of the tongue regenerate after from seven to fourteen days. The diarrhea may persist for from five to ten days.

ARIBOFLAVINOSIS

Sebrell and Butler called attention to the clinical manifestations attributed to riboflavin deficiency (ariboflavinosis) in 1938. Lesions of the lips manifest themselves by cheilosis, which begins as a pallor of the mucosa of the lips in the angles of the mouth and is followed by laceration and bilateral transverse fissures (Plate 12). The lesions which remain moist become covered with a honey-colored crust and are identical to those described by earlier writers as angular stomatitis. The lips become abnormally red along the line of closure and show a marked increase in vertical fissure due to superficial denudation of the mucosa. Sebrell and Butler also described a fine, scaly, greasy desquamation on a mildly erythematous base in the nasal labial fold on the alae nasae in the vestibule of the nose and on the ears. The angular stomatitis is not a specific sign of ariboflavinosis and may occur independent of it. A specific type of glossitis of the tongue is associated with riboflavin deficiency, and it is quite distinct from that attributed to nicotinic-acid deficiency. The tongue in ariboflavinosis is described as magenta or purplish-red in color (Plate 12). It is clean and the epithelium does not desquamate over the papillae but is flattened and swollen. The papillae are mushroom-shaped rather than atropic, giving the tongue a pebbly or granular appearance. The tongue may be painful and burn when food is taken. The scarlet (beefsteak) tongue of pellagra or nicotinic-acid deficiency (Plate 11) owes its color to desquamation of the epithelial cells of the papillae. The capillary loops then become more readily visible. In the magenta tongue of ariboflavinosis, the capillaries dilate and proliferate, and possibly the circulation is slowed. This may account for the magenta color of the tongue, in contrast with the pink color of the normal tongue.

Ocular Manifestations. The eye lesions of ariboflavinosis are characterized by a bulbar conjunctivitis, lacrimation, burning of the eyes and failing vision. Conjunctivitis and photophobia (Plate 12) are very prominent symptoms. In the center of Plate 12 is the same patient after two days' treatment with 15 mg. of riboflavin daily. The eye symptoms occur in the absence of errors of refraction or opacity of the lens, and there is a diminished visual acuity. Impaired visual acuity may result from such symptoms as burning of the eyes, lacrimation, blepharospasm, corneal opacities and iritis, all of which may occur in ariboflavinosis. Corneal vascularization as a manifestation of riboflavin deficiency is open to question.

Treatment. Most cases respond to treatment with riboflavin in doses of from 5 to 15 mg. by mouth daily. If the patient suffers from achlorhydria, vomiting, diarrhea, hepatic disease or other disorder preventing absorption or utilization, the riboflavin is given parenterally in doses of from 10 to 15 mg. It is best not to give too large doses of any single vitamin for long periods in the treatment of avitaminosis, for, although such a schedule may cure the major manifestations of the condition under treatment, it may precipitate a deficiency of another member of the vitmin B complex. In addition to vitamin therapy, the diet must include generous amounts of food rich in the vitamin B complex—whole-grain cereals, meat, milk, liver, eggs and cheese—otherwise the patient will relapse the moment riboflavin is withdrawn. Following the administration of riboflavin, photophobia, burning, itching and blepharospasm are relieved in from twenty-four to forty-eight hours and visual acuities slowly improve. Oral lesions begin to improve in three days or so, but complete resolution may take weeks.

SCURVY

The adult suffering from scurvy complains of weakness and pain in the limbs. Exaggeration of the reflexes of patella and biceps has been described. Navigators and explorers have stated that weakness is one of the early complaints of scurvy. This is associated with fatigue on exertion, palpitation and breathlessness. Multiple minute hemorrhages occur all over the body, particularly about the hair follicles of the lower extremities, which are brawny and tougher. Hemorrhage from the gums, stomatogingivitis and hypertrophy of the dental papillae may occur and are often followed by loosening of the teeth. The loosening of the teeth is due to the resorption of the alveoli of the jaw bones. One of the most reliable early signs of scurvy is gingivitis. The characteristic swollen, boggy gums of scurvy occur only when teeth are present and are most marked about defective teeth. Other hemorrhagic manifestations include hematuria, melena with diarrhea, pin-point hemorrhages in the gut with subsequent ulceration, menorrhagia, metrorrhagia, epistaxis, subperiosteal hematomata. Extravasations of blood from larger vessels into the muscles, as well as beneath mucous membrane, may occur. Farmer observed petechiae following slight trauma in volunteers kept on an ascorbutic diet for five months. The hemorrhagic manifestations have been stated to be due to abnormal capillary fragility, although pathologic changes have not been detected in the capillaries or small blood vessels, and more recent investigations point out that there is apparently no connection between vitamin C deficiency and capillary fragility.

Infantile Scurvy

This is still seen in children, in spite of general improvements in infant feeding. Infantile scurvy is more prevalent in the artificially fed than in the breast-fed infant, particularly if the infant is given overboiled, dried or condensed milk.

Treatment

Treatment in uncomplicated cases is the administration of fruit juices and large doses of vitamin C, from approximately 200 to 300 mg. two or three times a day by mouth, taken preferably before or with meals. Since gastric acid probably assists in absorption, there is no need to give vitamin C parenterally, unless there is nausea or vomiting or the patient has gastro-intestinal lesions that are likely to interfere with the absorption. The parenteral dosage is somewhat smaller than the oral dose, although 1,000 mg. a day have often been given with good results. It is difficult to overdose with vitamin C. In cases of mild or latent scurvy and infantile scurvy, 100 mg. daily by mouth are probably adequate. Fruit juices are also recommended, as cases that are resistant to pure vitamin C have been described. Intensive vitamin C treatment is continued until the lesions are healed and a maintenance dose of from 50 to 100 mg. per day is given orally. Many cases of scurvy are complicated by other vitamin deficiencies, and these should be searched for and treated. An enriched high vitamin nutritious diet should be given to ascorbutic patients, as well as specific vitamin C therapy.

High Vitamin Diets

In spite of the fact that diagnosis of the exact deficient state must be made as accurately as possible, it is often of more practical importance to recognize that the patient has nutritional deficiencies than to be able to name exactly what they are. In many cases of mild deficiency, the precise condition cannot be defined, and, in an effort to correct the condition, vitamin concentrates and a high vitamin diet should be administered. As has frequently been stated, experience shows that a mixed diet of natural foodstuffs, one especially rich in milk, green vegetables, fruit, butter, eggs and food, with ample protein of good biologic value, gives the best results.

Any individual in whom an underlying deficiency disease is suspected as responsible for the indefinite chronic condition presented should be placed upon a high vitamin diet.

In cases in which the deficiency points to one factor alone, the same high vitamin diet should be applied, with especial emphasis on the particular deficient factor. Four high vitamin diets are suggested—with seventy gm. of protein and 1,400, 1,800, 2,200 and 2,600 calories. The author realizes that the 1,400-calorie diet is not particularly high in vitamin A. For a condition needing high vitamin A and low calories he suggests the use of plain halibut-liver oil. For increasing or decreasing the protein content and calories, see page 82.

Foods to be emphasized in high vitamin diets:

Whole-grain cereals and breads
Butter
Glandular meats, especially liver
Citrous fruits and tomato
Fresh fruits
Leafy vegetables
Egg
Milk

The approximate average mineral content of the high vitamin diets is:

	Calcium	Phosphorus	Iron
High vitamin diet	1,000 Gm.	.0152 Gm.	1,400 Gm.

High Vitamin Diet

70 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 100, Protein 70, Fat 80, Calories 1,400

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)		
Bread (whole-grain)	60	3 thin slices
Butter	30	3 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	30	2 tablespoons
Meat (lean)	120	2 servings (4 oz.)
Bacon*		
Egg	100	2
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10–15%	300	3 servings
Vegetables and fruit, 20%		

* Two slices of crisp bacon once daily if desired.

High Vitamin Diet

70 Gm. Protein
1,400 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Egg	2	100
Bread (whole-grain)	1 thin slice	20
Butter	1 square	10
Cream, 20%	2 tablespoons	30
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad: Fresh vegetable	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	1 square	10
Milk	1 glass	200
Fruit, 10%	1 serving	100
DINNER		
Meat	1 serving	60
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	1 square	10
Milk	1 glass	200
Fruit, 15%	1 serving	100

High Vitamin Diet

70 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 110, Protein 70, Fat 120, Calories 1,800

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)		
Bread (whole-grain)	60	3 thin slices
Butter	65	6½ squares
Salad dressing with oil	15	1 tablespoon
Milk	400	2 glasses
Cream, 20%	30	2 tablespoons
Meat (lean)	120	2 servings (4 oz.)
Bacon*		
Egg	100	2
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10–15%	300	3 servings
Vegetables and fruit, 15%		
Potato, 20%	75	1 small serving

* Two slices of crisp bacon once daily if desired.

High Vitamin Diet

70 Gm. Protein
1,800 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Egg	2	100
Bread (whole-grain)	1 thin slice	20
Butter	1½ squares	15
Cream, 20%	2 tablespoons	30
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	2½ squares	25
Milk	1 glass	200
Fruit, 10%	1 serving	100
DINNER		
Meat	1 serving	60
Potato	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 thin slice	20
Butter	2½ squares	25
Milk	1 glass	200
Fruit, 15%	1 serving	100

High Vitamin Diet

70 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 175, Protein 70, Fat 135, Calories 2,195

Food	*Gram Weight*	*Household Measure*
Cereal (whole-grain, cooked)	140	⅔ cup
Bread (whole-grain)	90	3 slices
Butter	65	6½ squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon*		
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 10% juice	200	1 glass
Fruit, 10–15%	300	3 servings
Potato, 20%	100	1 serving

* Two slices of crisp bacon once daily if desired.

High Vitamin Diet

70 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (whole-grain, cooked)	⅔ cup	140
Egg	1	50
Bread (whole-grain)	1 slice	30
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Beverage		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	2½ squares	25
Milk	1 glass	200
Fruit, 10%	1 serving	100
3:00 P.M. Orange juice (10% fruit juice)	1 glass	200
DINNER		
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	2½ squares	25
Milk	1 glass	200
Fruit, 15%	1 serving	100

High Vitamin Diet

70 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 205, Protein 70, Fat 165, Calories 2,585

Food	*Gram Weight*	*Household Measure*
Cereal (whole-grain, cooked)	140	⅔ cup
Bread (whole-grain)	90	3 slices
Butter	100	10 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon*		
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 10% juice	200	1 glass
Fruit, 10–15%	300	3 servings
Potato, 20%	150	2 small servings
Sugar	15	1 tablespoon

* Two slices of crisp bacon once daily if desired.

High Vitamin Diet

70 Gm. Protein
2,600 Calories

Suggested Distribution of Total Food Allowance for One Day

BREAKFAST		
		Gm.
Fruit, 10%	1 serving	100
Cereal (whole-grain, cooked)	⅔ cup	140
Egg	1	50
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Beverage		
LUNCHEON		
Meat	1 serving	60
Potato	1 small serving	75
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	4 squares	40
Milk	1 glass	200
Fruit, 10%	1 serving	100
3:00 P.M. Orange juice		
10% fruit juice	1 glass	200
DINNER		
Meat	1 serving	60
Potato	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	4 squares	40
Milk	1 glass	200
Fruit, 15%	1 serving	100

RICKETS

Rickets is due to a deficiency of vitamin D and to lack of the proper proportion of calcium and phosphorus in the diet. It is the result of a restricted food supply and indoor life without adequate sunshine. The disease generally is confined to children.

The clinical picture of rickets is too often painted as if the bone changes alone were important. However, rickets is a disease which affects the whole body, so that even if the bony system were ignored, a very definite disease picture would remain. The rachitic infant is a tired, restless, unhappy creature. By day he is fretful, by night he sleeps badly, throwing off his bedclothes as he twists and turns. He rolls his sweating head impatiently on his pillow, even to the extent of wearing away his hair. His bowels are often constipated, with sudden attacks of diarrhea. His stomach is distended, partly because the intestines lack tone and are blown up by carbohydrate fermentation from his faulty diet, partly because the liver and the spleen are forced down by the deformed chest and partly because the abdominal muscles are flabby. This flabbiness affects all the other muscles of the body, while at the same time the ligaments of the joints are so involved that the limbs may be twisted into bizarre positions. The bony changes which may occur in rickets are craniotabes, a large square-shaped head, late closure of the fontanels, beading of the ribs (rachitic rosary), deformity of the chest, bending of the long bones, enlargement of the epiphyses and fractures.

TREATMENT

The amount of vitamin D required for the treatment of most infants with moderately severe rickets is about 1,200 I.U. a day. Individual needs vary greatly. The correct dose is that which cures the rickets. As long as the serum calcium remains below 12 mg. and there is no radiologic proof of healing, it is safe to increase the dose; but it must be remembered that toxicity may occur with a normal blood calcium. Up to 1,200 I.U. daily can be given as cod-liver oil, but higher doses need the use of one of the concentrated fish-liver oils.

The diet should contain large quantities of animal fats, such as meats, butter, eggs and fish, cod-liver oil, halibut-liver oil with viosterol, tuna-liver oil, large quantities of milk, cream, fresh vegetables, fruits and cheese.

TETANY

Tetany, especially the infantile type, is somewhat akin to rickets in that there is a low calcium. With lessened activity of the parathyroid, tetany may develop and a high calcium intake is indicated.

The hands and feet are drawn into the typical position, with the thumbs pressed against the fingers, which are held rigidly straight though flexed at the carpal and metacarpal joints with the wrist slightly bent. The feet are extended, while the toes are bent down and bunched together. These spasms may last for seconds or hours. They appear to be painful only when they start, so that children will often go on calmly playing with their toys during an attack. If the spasm lasts for some hours, both the hands and the feet swell from static congestion.

OSTEOMALACIA

Osteomalacia is a disease of mineral metabolism which results in softening of the bones and various skeletal deformities. There is some suggestion that it is a form of adult rickets.

The earliest symptom in osteomalacia is a vague tenderness or ache in the bones of the lumbosacral region and hips which is worse when the patient walks. As the condition progresses, the tenderness and the aching of the bones spread. The patient may even refuse to be touched at all and wince when approached. Bone deformities often occur with surprising rapidity. The patient appears to shrink, he loses height, partly by the bowing of the legs, chiefly by the softening of the spine, which may become twisted and always bows forward so that the ribs pile up over one another like the sticks of a fan, even coming to rest on the pelvis. The pelvis itself becomes grossly distorted. The legs twist and bend in any direction. In old people it is generally the spine that is most affected; in young people, the pelvis and the legs. Fractures from trivial falls from the normal pull of the muscles and from no apparent cause are common. They heal slowly or not at all. Muscular weakness and lassitude analagous to those of rickets occur. In all forms of osteomalacia, the blood calcium is generally low, often reaching tetanic levels. The inorganic phosphorus may be normal or low, while the phosphatase is slightly increased. The outlook as regards life is excellent with treatment. Some recovery of stature and amelioration of the deformities may be hoped for.

Treatment is with large doses of vitamin D; probably about 3,000 I.U. daily will be enough, but much larger doses may be required. To supply the necessary minerals for the recalcification of the bone, calcium phosphate, grains 30, three times a day should be given, as well as plenty of milk, cheese and fish. Roentgenography and calcium estimations should be used to make certain that adequate amounts of vitamin D, calcium and phosphorus are being given.

The chief factors to incorporate in a well-balanced diet are high protein, high calcium and phosphorus with plenty of cod-liver or halibut-liver oil, so as to have an abundance of vitamins A and D.

SPASMOPHILIA

The nervous symptoms of rickets are so important that they are often discussed as if they were a different disease, and it is true that some of the worse cases, those with generalized convulsions or prolonged attacks of tetany, show only very slight signs of the underlying rachitic condition. It may be the convulsions which first cause a suspicion that rickets is present. The proportion of rachitic children who suffer from spasmophilia varies greatly in different places. The underlying mechanism is a low blood calcium. When the calcium of the diet is high, the tendency to spasmophilia should be slight. The irritability of the nervous system manifests itself in many ways.

TREATMENT

The immediate treatment of convulsions is to put the child in a hot bath at a temperature of from 100 to 105 deg. F. Since calcium deficiency is the immediate cause of spasmophilia, the level in the blood should be raised rapidly. Calcium chloride, grains 15, three times a day in milk, may be tolerated and is ideal, since it is not only rapidly absorbed but, also, as the chloride ion is absorbed more than the calcium, it increases the ionization of the latter in the blood by acting on the acid-base equilibrium. If calcium chloride is badly tolerated, calcium lactate, grains 30, may be given instead. In continuous convulsions, 5 cc. of a 10 per cent solution of calcium levulinate or gluconate should be injected intravenously or into the buttocks. Sedatives should be given to all children who show signs of spasmophilia. Vitamin D acts slowly, and until it acts there is always the risk of general convulsions, which may even end fatally.

HIGH CALCIUM DIETS

For conditions requiring a high calcium intake the author has suggested four diets containing 80 Gm. of protein with 1,400, 1,800, 2,200 and 2,600 calories.

Foods emphasized in high calcium diets:

Milk, whole, skimmed, condensed.
Vegetables:
  Turnip greens, cauliflower, kohlrabi, celery, cabbage, carrot, parsnip, rutabaga, okra, spinach, turnip, chard, kidney bean and navy bean.

The approximate average mineral content of the high calcium diets is:

	Calcium	Phosphorus	Iron
High calcium diet	1.703 Gm.	1.703 Gm.	.0166 Gm.

High Calcium Diet

---

80 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 115, Protein 80, Fat 70, Calories 1,410

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)		
Bread (whole-grain)	45	1½ slices
Butter	30	3 squares
Salad dressing with oil		
Milk (skimmed)	1,000	5 glasses or 1 quart
Cream, 20%	15	1 tablespoon
Meat (lean)	120	2 servings (4 oz.)
Bacon*	10	2 slices, crisp
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cup)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 5–10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

* Two slices of crisp bacon once daily if desired.

High Calcium Diet

80 Gm. Protein
1,400 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, fresh	1 serving	100
Bacon*	2 slices, crisp	10
Egg	1	50
Bread (whole-grain)	½ slice	15
Butter	1 square	10
Cream, 20%	1 tablespoon	15
Milk (skimmed)	1 glass	200
Beverage		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-grain)	½ slice	15
Butter	1 square	10
Milk (skimmed)	1 glass	200
Fruit	1 serving	100
3:00 P.M. Milk (skimmed)	1 glass	200
DINNER		
Meat	1 serving	60
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-grain)	½ slice	15
Butter	1 square	10
Milk (skimmed)	1 glass	200
Fruit	1 serving	100
Bedtime. Milk (skimmed)	1 glass	200

* If desired.

High Calcium Diet

80 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 195, Protein 80, Fat 80, Calories 1,820

Food	*Gram Weight*	*Household Measure*
Cereal (whole-grain, cooked)	140	⅔ cup
Bread (whole-grain)	60	3 thin slices
Butter	35	3½ squares
Salad dressing with oil		
Milk (skimmed)	1,000	5 glasses or 1 quart
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon*	10	2 slices, crisp
Egg	100	2
Vegetables, 3%	300	3 servings (1½ cup)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 10–15%	300	3 servings
Potato or substitute	150	2 small servings
Sugar	10	2 teaspoons

* Two slices of crisp bacon once daily if desired.

High Calcium Diet

80 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, fresh	1 serving	100
Cereal (whole-grain, cooked)	⅔ cup	140
Bacon*	2 slices, crisp	10
Egg	1	50
Bread (whole-grain)	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Sugar	2 teaspoons	10
Milk (skimmed)	1 glass	200
Beverage		
LUNCHEON		
Egg or egg substitute	1 serving	50
Potato or substitute	1 small serving	75
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	1 square	10
Milk (skimmed)	1 glass	200
Fruit	1 serving	100
3:00 P.M. Milk (skimmed)	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	1½ squares	15
Milk (skimmed)	1 glass	200
Fruit	1 serving	100
Bedtime. Milk (skimmed)	1 glass	200

* If desired.

High Calcium Diet

80 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 215, Protein 80, Fat 115, Calories 2,215

Food	*Gram Weight*	*Household Measure*
Cereal (whole-grain, cooked)	140	⅔ cup
Bread (whole-grain)	60	3 thin slices
Butter	50	5 squares
Salad dressing with oil	15	1 tablespoon
Milk (skimmed)	1,000	5 glasses or 1 quart
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon*	10	2 slices, crisp
Egg	100	2
Vegetables, 3%	300	3 servings (1½ cup)
Vegetables, 6%	100	1 serving (½ cup)
Fruit, 10–15%	300	3 servings
Vegetables and fruit, 20%	150	2 small servings
Dessert	100	1 serving

* Two slices of crisp bacon once daily if desired.

High Calcium Diet

80 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, fresh	1 serving	100
Cereal (whole-grain, cooked)	⅔ cup	140
Bacon*	2 slices, crisp	10
Egg	1	50
Bread (whole-grain)	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Milk (skimmed)	1 glass	200
Beverage		
LUNCHEON		
Egg or egg substitute	1	50
Potato or substitute	1 small serving	75
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	2 squares	20
Milk (skimmed)	1 glass	200
Fruit	1 serving	100
3:00 P.M. Milk (skimmed)	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 thin slice	20
Butter	2 squares	20
Milk (skimmed)	1 glass	200
Dessert	1 serving	100
Fruit	1 serving	100
Bedtime. Milk (skimmed)	1 glass	200

* If desired.

High Calcium Diet

80 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 225, Protein 80, Fat 155, Calories 2,615

Food	*Gram Weight*	*Household Measure*
Cereal (whole-grain, cooked)	140	⅔ cup
Bread (whole-grain)	60	3 thin slices
Butter	60	6 squares
Salad dressing with oil	15	1 tablespoon
Milk	1,000	5 glasses or 1 quart
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon*	10	2 slices, crisp
Egg	100	2
Vegetables, 3%	300	3 servings
Vegetables, 6%	100	1 serving
Fruit, 10–15%	300	3 servings
Vegetables and fruit, 20%	150	2 small servings
Dessert	100	1 serving
Sugar	10	2 teaspoons

* Two slices of crisp bacon daily if desired.

High Calcium Diet

80 Gm. Protein
2,600 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, fresh	1 serving	100
Cereal (whole-grain, cooked)	⅔ cup	140
Bacon*	2 slices, crisp	10
Egg	1	50
Bread (whole-grain)	1 thin slice	20
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	2 teaspoons	10
Milk	1 glass	200
Beverage		
LUNCHEON		
Egg or egg substitute	1	50
Potato or substitute	1 small serving	75
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	2 squares	20
Milk	1 glass	200
Fruit	1 serving	100
3:00 P.M. Milk	1 glass	200
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 thin slice	20
Butter	2 squares	20
Milk	1 glass	200
Dessert	1 serving	100
Fruit	1 serving	100
Bedtime. Milk	1 glass	200

* If desired.

HYPOVITAMINOSIS E

The pathologic changes, if any, of vitamin E deficiency in human beings are unknown. In view of the uncertainty and the lack of knowledge of the relation of vitamin E to human health, little can be said of the incidence of its deficiency. Evidence for the occurrence of the disease—if there be a disease—rests mainly on the results of specific treatment of cases of habitual and threatened abortion. It has been hard to interpret the results because of the difficulty of controlling adequately the many possible variables. Vitamin E has never gained much popularity with gynecologists in the treatment of recurrent abortion, threatened abortion or the toxemias of pregnancy.

Bicknell, in 1940, first produced clinical evidence which suggested that muscular dystrophy might be a deficiency disease caused by lack of vitamin E, but it is now clear from clinical reports that have been discussed since that time that human muscular dystrophy is not, at least in the majority of cases, a simple deficiency disease identical to that caused in animals by lack of vitamin E. Hopes that vitamin E would be of value in certain degenerations of the central nervous system, notably amyotrophic lateral sclerosis, were rather high at one point, but evidence is now against this, though it must be admitted that the position is not as yet entirely clear. From the clinical results that have been discussed, it appears that alpha-tocopherol used alone and in large amounts is at best of uncertain value in progressive muscular atrophy and amyotrophic lateral sclerosis. According to some reports, vitamin E has had a transitory or prolonged effect on nerve degeneration, so that it is not possible to ignore the possibilities completely.

HEMORRHAGIC DISEASES OF THE NEWBORN—CERTAIN HEMORRHAGIC STATES

A spontaneous hemorrhagic diathesis appears when the blood prothrombin has fallen from 15 to 20 per cent of normal and is seen particularly in the newborn and in cases of idiopathic steatorrhea, obstructive jaundice and severe parenchymatous hepatic disease. Quick puts the critical level of hypoprothrombinemia at from 15 to 20 per cent of normal, although some others put it higher than this. Large hematomata may appear on the back, the thighs and other pressure areas, and hemarthrosis, hematemesis, epistaxis, hematuria and melena may occur. Menorrhagia, retinal hemorrhage and, in the case of infants, intracranial hemorrhage have been noted. Intractable hemorrhage from trivial wounds and umbilical hemorrhage in infants have been described. The blood coagulation time is prolonged, but capillary fragility is unaltered. Latent hemorrhagic hypoprothrombinemia occurs at the sight of obvious trauma when the prothrombin level has fallen to about 35 per cent of normal. Operation wounds begin to ooze or bleed, and the gums bleed if the teeth are brushed vigorously. Hematomata appear if the skin is pricked or a vein is punctured.

Treatment by Vitamin K

The need for treatment with vitamin K depends on the clinical detection of the vitamin K deficiency or on the estimation of the prothrombin time. A patient with a prothrombin time of more than thirty seconds, the normal value being from ten to twenty-five seconds, demands careful observation, and he may be considered a potential case of hemorrhage if his prothrombin time is above forty-five seconds. The treatment of hypoprothrombinemia with just sufficient vitamin K to raise the prothrombin level of the blood to normal will not safeguard against hemorrhage except for a very short period. Treatment must be continued beyond this point to build up a reserve in the body before operation, and the administration of the vitamin must be continued after operation. There appears to be no danger of hyperprothrombinemia—that is a prothrombin level higher than normal—through overdosage of vitamin K or its analogues.

NUTRITIONAL EDEMA

Nutritional edma is a term applied to types of edema in individuals subjected to insufficient and inadequate diets. Such a condition is rare in ordinary times or ordinary circumstances, but it may occur in large groups in times of partial famine and in institutions in which economy is the primary factor in establishing the diet.

In World War I a disease called war edema, or hunger edema, was seen in large numbers as early as 1915 in Poland. Von Jalesch states that in Bohemia alone 22,842 cases were listed. This condition was studied extensively on the Continent. In addition to a more or less generalized edema, a low blood pressure and a slow pulse were present. This condition was no doubt due to the restricted food intake. The protein foods were especially restricted, the carbohydrate was relatively high, and with a low fat content the diet was necessarily low in calories.

Today in general practice are seen occasionally patients who present the picture of generalized or local edema, perhaps with a hypochromic, microcytic anemia, without cardiovascular renal disease, but who for varied reasons have been on a diet too low in protein, fat and calories with a rather high carbohydrate intake. The obvious therapy is the re-establishment of an adequate diet high in protein, which is followed by rapid relief from symptoms in uncomplicated cases.

Not only is an adequate amount of protein necessary for health and growth but particularly are those proteins containing certain necessary amino acids indispensable. Not all proteins contain the essential amino acids (Table 1), and all therefore are not equally valuable. Some merely serve the general need for protein and others furnish the essential building stones. Clinically, protein deficiency is recognized almost solely by a specific effect, a decrease of the proteins of the blood with the resultant loss of osmotic pressure and the development of edema, so-called nutritional edema. The reduction of the serum proteins occurs principally in the albumin faction, the globulin being normal or slightly elevated in uncomplicated cases and reduced only in the severe cases. According to present standards, normal values are: Total protein, from 6.0 to 8.0 Gm. per 100 cc.; albumin, from 4.0 to 5.5 Gm. per 100 cc.; and globulin, from 1.4 to 3.0 Gm. per 100 cc.

TREATMENT

The patient should be placed on a diet incorporating approximately from 90 to 100 Gm. of protein. A certain portion (perhaps a third or more in adults) should be first-class protein; that is, of animal origin—meat, eggs, milk, cheese or fish. The treatment of a protein deficiency which has caused clinical and pathologic changes is simple and specific. Pregnancy and lactation require more protein.

DIET FOR NUTRITIONAL EDEMA

Only one diet is submitted for nutritional edema. This contains 100 Gm. of protein and 3,000 calories. The approximate average mineral content of the diet for nutritional edema is:

	Calcium	Phosphorus	Iron
Diet for nutritional edema	1.042 Gm.	1.765 Gm.	.0203 Gm.

Diet for Nutritional Edema

100 Gm. Protein
3,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 245, Protein 100, Fat 170, Calories 3,000

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	120	½ cup
Meat (lean)	180	2 large servings (6 oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3–6%	400	4 servings (2 cups)
Fruit, 10–15%	300	3 servings
Potato or substitute	200	2 servings
Dessert	100	1 serving
Sugar, jelly or jam	30	2 tablespoons

Diet for Nutritional Edema

100 Gm. Protein
3,000 Calories

Suggested Distribution of Total Food
Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Bacon	3 slices	15
Egg	2	100
Bread	1 slice	30
Butter	2 squares	20
Cream, 20%	½ cup	120
Sugar, jelly or jam	2 tablespoons	30
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 large serving	90
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Fruit, 10% or 15%	1 serving	100
DINNER		
Meat	1 large serving	90
Potato or substitute	1 serving	100
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Dessert	1 serving	100
Fruit, 10% or 15%	1 serving	100

SIMPLE GOITER

Simple goiter generally begins about puberty and is more common in females than in males. In certain areas of endemic colloid goiter, the water and the vegetables raised from the soil are deficient in iodine. The normal thyroid gland stores about 25 mg. of iodine. Marine believes that the yearly requirements probably do not exceed 50 mg. In iodine deficiency, iodine in the form of iodized salt may be administered. Plummer and Haines used a few drops of compound solution of iodine once a week and felt this was adequate. A word of warning should be given regarding the indiscriminate continued use of iodine, as there is danger of inducing hyperthyroidism in old adenomas. Iodine should also be used carefully in exophthalmic goiter.

Two pathologic conditions result from the lack of iodine: simple goiter and a hypofunction of the thyroid gland (hypothyroidism). Goiter can be present without interference in any body function, except such as may be caused by a localized tumor. Hypothyroidism, on the contrary, affects many body functions and affects the growth and the activity of all the tissues of the body. The pathologic changes in the thyroid due to lack of iodine are a hypertrophy and hyperplasia of the secreting cells, a loss of colloid and an increase in vascularity associated with a relatively soft enlargement of the gland without thyrotoxicosis.

TREATMENT

The preventative or prophylactic treatment of goiter due to iodine deficiency is highly successful. Prophylaxis is more important than curative treatment. The human requirement of iodine is from about 0.02 to 0.75 mg. per day. This amount can be obtained readily in the food and the drinking water in regions in which the soil contains sufficient iodine and in which sea food is eaten. Even in regions where the soil and the water are less rich in iodine, a proper diet which includes a fair proportion of leafy vegetables will provide a sufficient quantity.

MACROCYTIC ANEMIA

Pernicious anemia and the related macrocytic anemias are interesting and unique types of deficiency disease. When Minot and Murphy discovered the therapeutic value of liver for patients with pernicious anemia, it became evident that a nutritional disturbance was probably somehow involved in the production of the disease. The exact nature of the nutritional abnormality and the relationship of the several forms of the related macrocytic anemias to each other did not become clear until Castle and his associates published their studies of the pathogenesis of pernicious anemia. According to Castle's hypothesis, in the normal individual an extrinsic factor obtained from the food mixes with an intrinsic factor and interaction takes place within the intestines, the mixture is absorbed and a further chemical change occurs to form the thermostable antianemic principle. This is stored chiefly in the liver and passes from there to the bone marrow to take part in maturation of the red corpuscles. In pernicious anemia, the intrinsic factor is lacking and this causes a deficiency through faulty assimilation, even though the diet is adequate. The same results, namely, macrocytic anemia, may be produced by a lack of the extrinsic factor in the diet, by the failure to absorb the two factors or by a combination of dietary deficiency, insufficient intrinsic factor and faulty absorption. It may be further postulated that macrocytic anemia may also be caused by increased requirements, imperfect utilization or faulty storage or metabolism of an active hematopoietic principle in the liver. In this way it would be possible to explain the development of macrocytic anemia in tropical nutritional anemia (deficient diet), following total gastrectomy (lack of intrinsic factor), in sprue and pellagra (poor absorption as well as defective diet), following resection of the intestines (poor absorption), in pernicious anemia of pregnancy (increased requirements of the fetus, together with deficient diet) and in chronic and extensive liver disease (faulty storage of liver principle and deranged function of that organ). Unfortunately, the matter does not appear to be, and probably is not, as simple as this. Castle's observations have been confirmed by many investigators and an attempt to disprove his hypothesis regarding the necessity of an interaction between two factors has not been successful. The discovery that a synthetic substance, folic acid, which appears to be one of the B vitamins, is capable of inducing in cases of pernicious anemia, sprue, pernicious anemia of pregnancy and other forms of macrocytic nutritional anemia a remission similar to that caused by liver extract promises to answer many of the questions which have been posed. If the key substance which is lacking in the nutritional macrocytic anemia is related to folic acid, it is not difficult to understand why it has been impossible to produce pernicious anemia in animals. It is well known that this substance can be synthesized by intestinal bacteria.

RELATED MACROCYTIC ANEMIAS

Macrocytic Anemia of Pregnancy. Macrocytic anemia of pregnancy is a rare disease in temperate climates. The symptoms, which develop insidiously during mid-pregnancy, are easy fatigability, pallor, weakness, fever without evident infection and lack of a sense of well-being. Also, in the more severe cases, sore tongue, prostration, dyspnea and edema may appear. The spleen is frequently palpable. The peripheral blood and bone marrow show the characteristic hematologic changes of pernicious anemia, but macrocytosis may be of more moderate degree and a mean corpuscular hemoglobin concentration is frequently below normal. Pregnancy that may occur in a woman with pernicious anemia should not be confused with macrocytic anemia of pregnancy.

TREATMENT: Recovery follows the administration of liver extract or folic acid, 20 mg. daily. Dietary inadequacies should be corrected and vitamin supplements provided. After the birth of the baby the administration of liver extract or folic acid may be discontinued. The patient should be observed periodically in order to make certain that true Addisonian pernicious anemia does not develop. Recurrence of the anemia with succeeding pregnancies is unusual.

Macrocytic Anemia in Pellagra. A small percentage of patients with pellagra or other deficiencies of the vitamin B complex may develop a macrocytic anemia. The anemia is apparently caused by a dietary deficiency of the extrinsic factor associated in many, but not all, instances with poor absorption from the gastrointestinal tract. Inadequate production of the intrinsic factor is also probably a contributing influence. Patients who develop this form of macrocytic anemia give a history of having consumed diets deficient in animal protein and in the vitamins of the B complex for many years. The anemia usually responds to the oral administration of folic acid or to the intramuscular administration of liver extract.

Nutritional or Tropical Macrocytic Anemia. Wills should be given the credit for directing attention to the nutritional macrocytic anemia occurring among natives of tropical and semitropical climates. Marmite or yeast extracts produced brilliant therapeutic results in patients with the disease. Wills concluded that tropical macrocytic anemia was due to a deficiency in the diet of some factor at present unidentified, not Castle's extrinsic factor. Nutritional macrocytic anemia in the tropics is apparently more common among women and appears quite frequently in association with pregnancy. The patients certainly respond to crude liver extract given parenterally or to autolyzed yeast by mouth. If faulty dietary habits are corrected and adequate amounts of animal protein are consumed, specific antianemic therapy apparently need not be continued after recovery.

Deficiency Diseases *(Continued)*

PERNICIOUS ANEMIA

Nature of the Disease

Conditioned deficiency disease with obscure disturbance destroying red blood cells more rapidly than they can be formed

Object of Diet

The ingestion of adequate amounts of liver and folic acid

Pernicious anemia is a conditioned deficiency disease caused by inadequate production of an intrinsic factor. This does not completely explain the development of the disease, and the reason for the mucosal atrophy in the fundus of the stomach is not understood. Pernicious anemia is a disease of adult life; it occurs usually after the age of forty years. Its incidence increases with advancing age. Cases have been reported in children, but they are rare. Pernicious anemia usually develops insidiously with progressive weakness, pallor and anorexia. Numbness and tingling or burning of hands and feet are often present for months before the patient sees a physician. Burning of the tongue and the mouth may be troublesome complaints for a short period and then disappear. One of the characteristic findings in pernicious anemia is the absence of the hydrochloric acid in the stomach. Diarrhea, as well as epigastric fullness and other vague abdominal symptoms, is not uncommon. The blood smear from a case of pernicious anemia (Plate 13) shows a macrocytic anemia. After the red-blood-cell level has fallen below two million cells, dyspnea and palpitation are usually present. However, the development of the anemia is often so gradual that the patient adjusts moderately well to his diminished supply of oxygen.

Until 1926, when Minot and Murphy introduced the liver diet as a means of controlling pernicious anemia, the disease was a slowly progressive, fatal one with occasional remissions. The use of liver, liver extract or folic acid has revolutionized the outlook for the disease.

Castle's brilliant observation showed that beef protein predigested in the normal stomach also controlled pernicious anemia. Since this work, Sturgis, Isaacs and associates used desiccated gastric tissue, which led to the development of ventriculin. Conner has used both raw and desiccated gastric tissue, apparently with the same results.

Most patients find it an ordeal to eat from one half to one pound of liver per day and are glad to take liver extracts or folic acid instead. With liver extracts and folic acid, 20 mg. daily, readily available, no special attempt need be made to include liver in the diet. If the hemoglobin rise lags behind the red-blood-cell increase, iron should be given. It is preferable to withhold iron therapy until after the reticulocyte response to liver has occurred in order that the response may be used to confirm the diagnosis. Transfusions are necessary only when the erythrocyte level is well below one million cells, or when a complication such as cardiac failure or bronchopneumonia is present.

As already mentioned, many developments apart from diet therapy control pernicious anemia. In spite of these facts it is well to emphasize to these patients the additional aid to be obtained by a diet high in vitamin content with an adequate amount of liver.

IMPORTANT FACTORS IN DIETARY TREATMENT OF PERNICIOUS ANEMIA

1. Liver: In abundance.
2. Folic acid.

Abundance of Liver. It is probably best to give at least one half pound of liver a day in the average case. In severe cases, up to 500 Gm. a day may be required. Calf's liver is preferable to beef or hog liver because it is more tender and less sinewy, but any mammalian or fowl liver may also be used for variety.

Innumerable recipes for preparing liver have been devised in an effort to increase its palatability. It has been the author's experience, however, that finely ground raw liver with the fiber removed and given in orange juice, tomato juice or cranberry juice, or broiled or fried liver with bacon, sometimes seasoned with a little onion, is more palatable to the average patient than liver prepared according to the many complicated recipes.

Folic Acid. The mechanism of the action of folic acid and its relation to other known hematopoietic factors have not been demonstrated. It does not affect the blood of normal individuals. Folic acid, so-called because it occurs in green leaves, is also present in animal tissues, such as liver and kidney, and in mushrooms and yeast, green vegetables and green peas. Spies suggests 20 mg. daily parenterally or by mouth.

The part that folic acid will play in practical therapeutics is still uncertain, particularly the extent to which it may supplant the use of liver extract. It is not yet certain that folic acid is fully equal to liver extract in maintaining remissions, and particularly in preventing the development of neurologic degeneration in pernicious anemia.

DIRECTIONS FOR APPLICATION OF DIETS

The two chief factors, namely, abundance of liver and high vitamin intake, are presented for application to patients with pernicious anemia by dividing the diets into two series. One series uses cooked liver; the other, raw liver. Diets selecting foods of a high vitamin content with from 100 to 110 Gm. of protein and from 2,000 to 2,8000 calories are outlined with suggested distribution for the day.

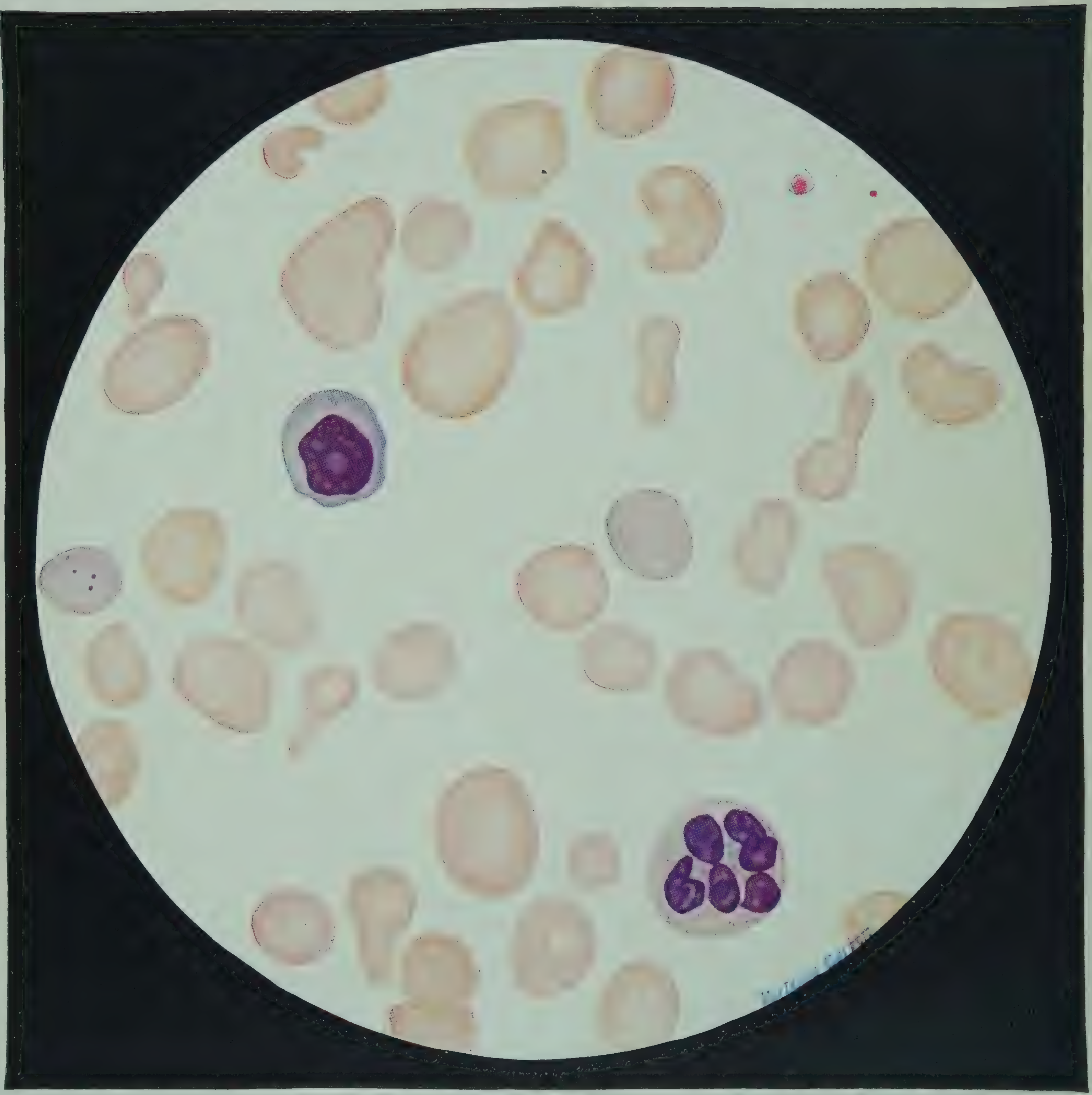
The only reason for restricting or avoiding any food in treating pernicious anemia is that the indiscriminate use of certain foods, such as sweets and desserts, may, first, tend to displace the foods particularly needed and, second, result in the individual's gaining too much weight.

If the individual is too ill and has difficulty in taking liver, liver extract may be supplemented until solid food can be taken. It may even be necessary to use folic acid or inject extract of liver intramuscularly before a solid diet will be tolerated.

The approximate average mineral content of these diets is:

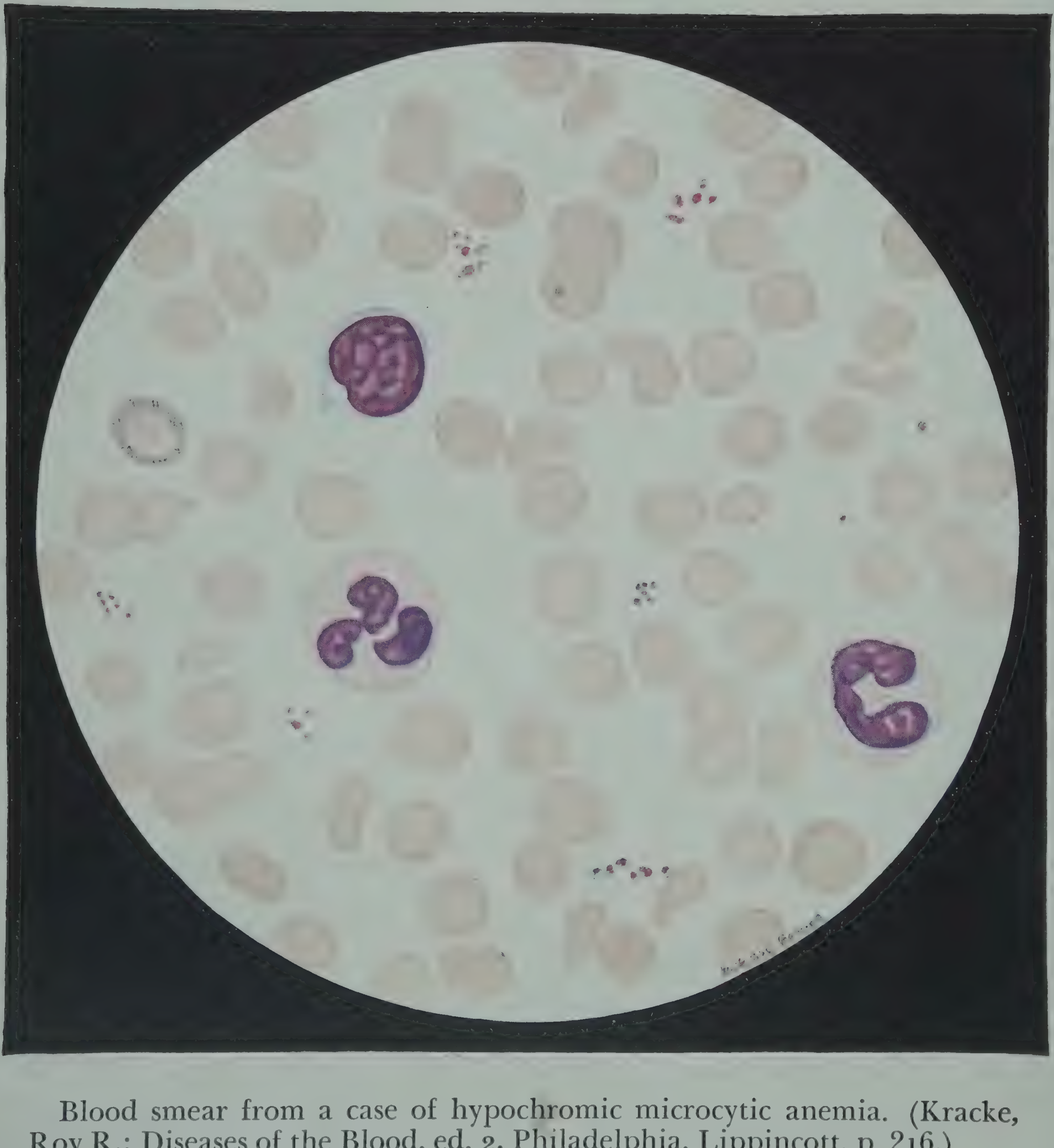
Calcium	1.20
Phosphorus	1.88
Iron	.0225

PLATE 13



Blood smear from a case of pernicious anemia, showing macrocytic anemia. (Kracke, Roy R.: Diseases of the Blood, ed. 2, Philadelphia, Lippincott, p. 278.)

PLATE 14



Blood smear from a case of hypochromic microcytic anemia. (Kracke, Roy R.: Diseases of the Blood, ed. 2, Philadelphia, Lippincott, p. 216.)

Principal foods to include in the diet:

- Liver in large amounts
- Any other meats as desired
- Yeast
- Fish meal
- Eggs
- Bone marrow
- Milk powder
- Whey

Cereal grains:

- Wheat
- Malt sprouts
- Oats
- Ground corn
- Rice bran
- Alfalfa meal
- Soybean meal

Vegetables:

- Cabbage
- Lettuce
- Spinach
- String bean
- Tomato
- Carrot
- Pea
- Squash
- Onion

Fruits:

- Orange
- Grapefruit
- Apple
- Apricot
- Peach
- Prune
- Banana

Diet with ½ Lb. Cooked Liver

100 Gm. Protein
2,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 175, Protein 100, Fat 100, Calories 2,000

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread (whole-wheat)	90	3 slices
Butter	45	4½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Liver	240	2 very large servings (½ lb.)
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit juice, orange	200	1 glass
Fruit, 10%, 15%	300	3 servings
Potato or substitute		
Sugar	10	2 teaspoons

Diet with ½ Lb. Cooked Liver

100 Gm. Protein
2,000 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Meat	1 serving	60
Egg	1	50
Bread (whole-wheat)	1 slice	30
Butter	1 square	10
Sugar	2 teaspoons	10
Cream, 20%	¼ cup	60
LUNCHEON		
Liver	1 very large serving	120
Vegetables, 3%	2 servings	200
Bread (whole-wheat)	1 slice	30
Butter	1½ squares	15
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Orange juice	1 glass	200
Liver	1 very large serving	120
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-wheat)	1 slice	30
Butter	2 squares	20
Fruit, 10 or 15%	1 serving	100
Milk	1 glass	200

Diet with ½ Lb. Cooked Liver

105 Gm. Protein
2,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 210, Protein 105, Fat 130, Calories 2,430

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread (whole-wheat)	90	3 slices
Butter	80	8 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices
Liver	240	2 very large servings (½ lb.)
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (1 cup)
Fruit juice, orange	200	1 glass
Fruit, 10%, 15%	300	3 servings
Potato or substitute	150	2 small servings
Sugar	15	1 tablespoon

Diet with ½ Lb. Cooked Liver

105 Gm. Protein
2,400 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Meat	1 serving	60
Egg	1	50
Bread (whole-wheat)	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Liver	1 very large serving	120
Potato or substitute	1 small serving	75
Vegetables, 3%	2 servings	200
Bread (whole-wheat)	1 slice	30
Butter	3 squares	30
Fruit, 10 or 15%	1 serving	100
Milk	1 glass	200
DINNER		
Orange juice	1 glass	200
Liver	1 very large serving	120
Bacon	2 slices	10
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-wheat)	1 slice	30
Butter	3 squares	30
Fruit, 15%	1 serving	100
Milk	1 glass	200

Diet with ½ Lb. Cooked Liver

110 Gm. Protein
2,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 220, Protein 110, Fat 165, Calories 2,805

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread (whole-wheat)	90	3 slices
Butter	80	8 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	120	½ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices
Liver	240	2 very large servings (½ lb.)
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (1 cup)
Fruit juice, orange	200	1 glass
Fruit, 10%, 15%	300	3 servings
Potato	200	2 servings
Sugar	15	1 tablespoon

Diet with ½ Lb. Cooked Liver

110 Gm. Protein
2,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Meat	1 serving	60
Egg	1	50
Bread (whole-wheat)	1 slice	30
Butter	2 squares	20
Sugar	1 tablespoon	15
Cream, 20%	½ cup	120
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Liver	1 very large serving	120
Potato or substitute	1 serving	100
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-wheat)	1 slice	30
Butter	3 squares	30
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Orange juice	1 glass	200
Liver	1 very large serving	120
Bacon	2 slices	10
Potato or substitute	1 serving	100
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-wheat)	1 slice	30
Butter	3 squares	30
Fruit, 10 or 15%	1 serving	100
Milk	1 glass	200

Diet with ½ Lb. Raw Liver

100 Gm. Protein
2,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 220, Protein 100, Fat 80, Calories 2,000

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread (whole-wheat)	90	3 slices
Butter	30	3 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Liver (raw)*	240	½ lb.
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit juice, 10%	800	4 glasses
Fruit, 10%, 15%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

* Preparation of raw liver purée, p. 382.

Diet with ½ Lb. Raw Liver

100 Gm. Protein
2,000 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (whole-wheat)	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
10 A.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60
LUNCHEON		
Vegetables, 3%	2 servings	200
Bread (whole-wheat)	1 slice	30
Butter	1 square	10
Fruit	1 serving	100
Milk	1 glass	200
2 P.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60
4 P.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60
DINNER		
Meat	1 serving	60
Vegetable, 6%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-wheat)	1 slice	30
Butter	1 square	10
Fruit	1 serving	100
Milk	1 glass	200
8 or 9 P.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60

Diet with ½ Lb. Raw Liver

105 Gm. Protein
2,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 260, Protein 105, Fat 105, Calories, 2,405

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread (whole-wheat)	90	3 slices
Butter	60	6 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Liver (raw)	240	½ lb.
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit juice, 10%	800	4 glasses
Fruit, 10%, 15%	300	3 servings
Potato	150	2 small servings
Sugar	10	2 teaspoons

Diet with ½ Lb. Raw Liver

---

105 Gm. Protein
2,400 Calories

Suggested Distribution of Total Food Allowance for One Day

BREAKFAST		*Gm.*
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (whole-wheat)	1 slice	30
Butter	2 squares	20
Sugar	2 teaspoons	10
Cream, 20%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
10 A.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60
LUNCHEON		
Potato	1 small serving	75
Vegetable, 6%	1 serving	100
Vegetables, 3%	1 serving	100
Bread (whole-wheat)	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
2 P.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60
4 P.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60
DINNER		
Meat	1 serving	60
Potato	1 small serving	75
Vegetable, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Bread (whole-wheat)	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
8 or 9 P.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60

Diet with ½ Lb. Raw Liver

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110 Gm. Protein
2,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 275, Protein 110, Fat 140, Calories 2,800

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread (whole-wheat)	90	3 slices
Butter	50	5 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	120	½ cup
Meat (lean)	60	1 serving (2 oz.)
Liver (raw)	240	½ lb.
Bacon	10	2 slices
Egg	50	1
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (½ cup)
Fruit juice, 10%	800	4 glasses
Fruit, 10%, 15%	300	3 servings
Potato	200	2 servings
Sugar	15	1 tablespoon

Diet with ½ Lb. Raw Liver

110 Gm. Protein
2,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

	BREAKFAST	
		Gm.
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices	10
Egg	1	50
Bread (whole-wheat)	1 slice	30
Butter	1 square	10
Sugar	1 tablespoon	15
Cream, 20%	½ cup	120
Beverage—coffee, tea or coffee substitute		
10 A.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60
	LUNCHEON	
Potato	1 serving	100
Vegetables, 3%	1 serving	100
Salad:		
Fresh vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-wheat)	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
2 P.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60
4 P.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60
	DINNER	
Meat	1 serving	60
Potato	1 serving	100
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-wheat)	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
8 or 9 P.M. Fruit juice	1 glass	200
Raw liver purée	⅛ lb.	60

Deficiency Diseases *(Continued)*

SPRUE

Nature of the Disease

State of deficiency disease affecting the gastro-intestinal tract and producing a macrocytic, hyperchromic anemia.

Object of the Diet

High protein, high vitamin, high folic acid, restricted carbohydrate and low fat.

Sprue, Idiopathic Steatorrhea or Nontropical Sprue, Celiac Disease. The etiology of sprue is still a matter of discussion. It is now generally agreed that tropical sprue, nontropical sprue or idiopathic steatorrhea and celiac disease are varieties of the same disorder (the sprue syndrome). Originally supposed to be due to Monilia infection, sprue is now believed to be a deficiency disease. The symptoms, of which there are an infinite variety, may be broadly classified under oral, gastro-intestinal, hematologic and mental. The disease lasts for a number of years, with alternate exacerbations and remissions. It begins insidiously with periods of diarrhea, stomatitis and glossitis, and in a well-established case the stools are characteristic, the abdomen is distended, emaciation is progressive and there is a characteristic macrocytic anemia. Dyspepsia and diarrhea are prominent and constant in sprue. Diarrhea in the acute form is frequently watery, the stools are classically bulky, pasty, pale gray, frothing from the presence of intestinal gas and particularly foul-smelling. Much fat and fatty acid crystals appear in the stools. After the diarrhea a characteristic anemia indistinguishable hematologically from pernicious anemia presents itself. Many other symptoms may be seen in a case of sprue; in loss of weight, muscle-wasting, muscular cramps and tetany are frequent in well-marked cases. Tetany is the result of the low blood calcium. The mental disturbances in sprue are said to be characteristic and of diagnostic aid. The patient is irritable and cross, and his mental condition seems to run parallel with that of his bowels. A flat blood-sugar curve following ingestion of glucose which indicates a low glucose tolerance is a characteristic finding in tropical and nontropical sprue and in celiac disease. A rise of less than 40 mg. per 100 cc. above fasting level after the ingestion of 1 Gm. of glucose per kilo of body weight is common. The flat curve is due to delayed or defective absorption of glucose, as an intravenous glucose tolerance test gives a normal curve. Blood calcium and phosphorus are lower than normal. This is because calcium is lost in the intestine by the formation of insoluble soaps with the fatty acids. Vitamin D deficiency results from imperfect fat absorption.

Holmes and Starr, Blumgart, Mumford and others have reported cases of nutritional disturbances in adults resembling sprue. Marble and Bauer feel that the low serum calcium and phosphorus, osteoporosis and the tetany seen in cases of sprue do not result from parathyroid deficiency but from the inadequate absorption of calcium and phosphorus from the gastro-intestinal tract because of the existing diarrhea.

IMPORTANT FACTORS IN DIETARY TREATMENT OF SPRUE

1. Fat: As low as possible
2. Protein: high
3. Carbohydrate (principally from fruits and vegetables): Restricted
4. Folic acid: High
5. Vitamins (particularly B and C): High.

Many special diets have been employed in the treatment of sprue in various parts of the world. The strawberry cure, giving large amounts of strawberries, was in vogue in India and in China. In New Orleans, the banana cure was developed. In this, from ten to twenty-four thoroughly ripe bananas a day were given. These limited diets, such as the strawberry diet, the banana diet, the skimmed-milk diet, etc., formerly the only available form of therapy, are no longer needed.

In beginning the treatment of sprue, particularly when the diarrhea is severe, it is best usually to limit the diet to strained fruit juices and puréed green vegetables. Manson used the milk diet, giving from three to six pints of milk daily for several weeks. Milk is one of the most important articles of food in the treatment. It may be given every two or three hours, three or four ounces at each feeding and increased after the diarrhea subsides to from six to eight ounces. As the patient convalesces, up to a pint five times a day may be used. Soft-cooked eggs, scraped beef, minced chicken and tender meats may be added as soon as possible, as they leave practically no residue. Cane-sugar products, including sirup, pies, candies and desserts of all kinds, should be avoided, not only during treatment but for months after all symptoms have subsided. No coffee, tea, Coca-Cola or other caffeine beverages should be used.

The author is giving only one diet to be used as a basis in the treatment of sprue after the acute stage has subsided. The carbohydrate content is 150 Gm.; protein, 145 Gm.; and fat, 60 Gm., yielding approximately 1,700 calories. More calories may be added as the patient can take more protein food or as soon as he is able to tolerate more carbohydrate or fat.

In addition to the diet treatment, folic acid, 20 mg., should be given by mouth each day. Liver extract given parenterally every day or two is of great value. Vitamin B complex and cevitamic acid should be given daily. It is advisable to use calcium and phosphorus combined with vitamin D. In acute, severe anemic, very ill patients, blood transfusions are indicated.

145 Gm. Protein
1,700 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD INTAKE FOR ONE DAY

Carbohydrate 150, Protein 145, Fat 60, Calories 1,720

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread (whole-wheat or toast)	60	3 thin slices
Butter	10	1 square
Salad dressing with oil		
Milk (skimmed)	1,000	5 glasses (1 quart)
Cream, 20%		
Meat (low in fat)	420	14 oz.
Bacon		
Egg		
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 5%		
Fruit, 10–15%	300	3 servings
Fruit, 20% (banana)	100	1 serving or 1 medium-sized banana

145 Gm. Protein
1,700 Calories

Suggested Distribution of a Total Food Intake for One Day

		Gm.
BREAKFAST		
Fruit	2 servings	200
Meat (low in fat)	1 large serving (4 oz.)	120
Bread (toast)	1 thin slice	20
Milk (skimmed)	1 glass	200
LUNCHEON		
Meat (low in fat)	1 large serving (5 oz.)	150
Vegetables, 3%	1 serving	100
Bread	1 thin slice	20
Fruit	1 serving	100
Milk (skimmed)	1 glass	200
3 P.M. Milk (skimmed)	1 glass	200
DINNER		
Meat (low in fat)	1 large serving (5 oz.)	150
Vegetables	2 servings	200
Bread	1 thin slice	20
Butter	1 square	10
Fruit (banana)	1 serving	100
Milk (skimmed)	1 glass	200
8 P.M. Milk (skimmed)	1 glass	200

Deficiency Diseases *(Continued)*

HYPOCHROMIC, MICROCYTIC ANEMIA

Nature of Disease

Reduction of hemoglobin with varied diminution of red blood cells

Object of Diet

To provide foods most effective in promoting blood regeneration

Hypochromic, microcytic anemia is a conditioned deficiency disease and a manifestation of iron deficiency. In most adults the deficiency is associated with the loss of iron. This is due to hemorrhages of various types and from different causes. A common cause is the physiologic loss of blood in women by menstruation or pregnancy, or both. Hemorrhage from such conditions as peptic ulcer, bleeding hemorrhoids, uterine lesions (especially fibroids) and cirrhosis of the liver, other types of blood loss, nutritional factors from faulty diets, infections and septic diseases, intestinal parasites and associated chronic maladies, such as tuberculosis, cancer and nephritis, may result in iron deficiency.

In some instances the cause cannot be determined. The symptoms which develop in patients with hypochromic anemia are insidious in their onset. Many of the complaints are those common to all anemias: pallor, weakness, fatigability, shortness of breath on exertion, palpitation and tachycardia with a feeling of exhaustion. About 30 per cent of the cases have a sore tongue or sore mouth. Pallor of the skin, mucous membrane and nail beds are proportional to the reduction in hemoglobin. The eyes may have blue-white sclerae. Paleness of the red blood corpuscles is the most characteristic change in the blood smears (Plate 14, facing page 383). The hemoglobin is reduced to a greater extent than the red-cell count. The latter is rarely less than three million cells per cu. mm. and often is within the normal range. The hemoglobin may be less than 5 Gm. per 100 cc.

Disturbances of the gastro-intestinal tract which interfere with absorption and utilization of iron from the food are factors in hypochromic anemia. A hypochlorhydria or achlorhydria hinders the absorption of iron.

Treatment. A daily intake of from 12 to 15 mg. of iron is the average daily requirement. It is not difficult to provide this amount as long as the diet includes one egg and one serving of meat per day. One serving of red meat, one egg, a pint of milk, four slices of whole-wheat or fortified bread and two servings of vegetables will supply at least two thirds of that amount. Once iron deficiency has developed, dietary management is not sufficient, and iron must be given therapeutically. Inorganic iron by mouth is the treatment of choice for hypochromic, microcytic anemia. There are many preparations of iron that are effective in adequate doses. Adequate doses of the various commonly used iron preparations for adults are: Ferrous sulfate (0.3 Gm.—5 grains), three or four times daily; ferrous carbonate pills (15 grains), four times daily; iron and ammonium citrate (2 Gm.), three times daily; and 1 Gm. reduced iron three times daily. Iron should be given in divided doses and after meals so as to lessen gastro-intestinal discomfort.

IMPORTANT FACTORS IN DIETARY TREATMENT OF HYPOCHROMIC, MICROCYTIC ANEMIA

1. Mineral elements (especially iron and copper): Rich
2. Vitamin content: High
3. Protein: moderately high

The most important factor in treating hypochromic, microcytic anemia is the careful and thorough search for the causative factors of the anemia and the elimination of these factors whenever possible. Although diet plays a major role in the treatment of hypochromic, microcytic anemia, there are certain types of cases that will be influenced but little by any type of dietary procedures. There are also cases of hypochromic anemia in which the primary cause requires specific dietetic therapy. In these cases the principles of the diet must be directed to the needs of the primary disease rather than the anemia. Certain foods have been studied with regard to their blood-building properties and these are listed under foods to be emphasized in hypochromic, microcytic anemia.

DIRECTIONS FOR APPLICATION OF DIETS

The author has outlined four diets for use in the treatment of hypochromic, microcytic anemia. These may be used for all cases of hypochromic anemia in which there is no need for special dietetic therapy for the primary cause of the anemia. These four diets contain from approximately 20 to 25 mg. of iron, from 80 to 90 Gm. of protein, 1,400, 1,800, 2,200 and 2,600 calories.

Foods to be emphasized in the treatment of hypochromic, microcytic anemia:

Meats

The meats that are most potent as blood builders are:

Liver—one large serving (3 oz.) should be included in the diet three or four times a week
Kidney
Beef
Chicken—gizzard
Lamb
Pig

Egg

Fruits

The fruits that are most potent as blood builders are:

Apricot
Peach
Prune
Raisin

Two or three servings of fruit selected from this group should be included in the diet daily.

Vegetables

The vegetables that are most potent as blood builders are:

Spinach
Beet greens
Lettuce

COMPARATIVE DIET FACTORS IN HEMOGLOBIN PRODUCTION

Investigations have shown that food is the most important factor in the treatment of anemia. For many years various laboratories, especially those of Whipple and Robscheit-Robbins, have definitely demonstrated that the amount of blood regeneration in the animal body may be influenced at will by diet factors. Table 18 on page . . . gives a good comparison of this work, showing how different foods influence blood regeneration. Of the most common foods, cereals and breadstuffs give a minimum response to blood formation, while liver is the most potent substance that influences hemoglobin production.

Dairy Products. While dairy products are invaluable food factors in general nutritional requirements, they are poor blood builders. Whole milk added to a bread diet has apparently no influence on blood formation. Cream, butter and cheese added to a bread diet show only a slight favorable influence on blood building. Fish ranks with dairy products as blood builders.

Vegetables. Vegetables are often overemphasized in their importance as blood builders. A large amount of vegetables may be added to the bread ration and yet only a slight increase in blood formation is noted. The leafy vegetables, such as lettuce, spinach, chard and beet greens, are considered to have only slight effect as blood builders. On the whole, vegetables are important food factors, but experiments with animals have shown that they are poor blood builders.

Fruits. Fruits vary in their potency as blood builders; for instance, raspberries give absolutely negative results as a blood builder, while other fruits, such as peaches, apricots and prunes, both fresh and dried, compare favorably with some meat products.

Liver. Liver is the most potent of all the food substances in hemoglobin production. Pork, chicken and beef liver are equally effective. Fish livers are inert as blood builders.

Other Meats. Most potent of meats, other than liver, as a blood builder is kidney. Gizzard ranks second to liver and kidney. Beef muscle is a good blood builder, but it ranks below stomach and heart muscle.

TABLE 18

HEMOGLOBIN PRODUCTION INFLUENCED BY DIET

Diet in Grams per Day	Hemoglobin production for two-week period (Grams)
Bread 450	3
Bread 350	3
Milk 450, bread 450	3
Milk 450, bread 350	3
Cream 100, bread 350	12
Cream 100, bread 500	10
Butter 100, bread 350	10
Butter 75, bread 450	11
Cheese 100, bread 450	20
Spinach 250, bread 400	14
Beet greens 200, bread 300	20
Codfish 100, bread 300	9
Fresh fish 100, bread 300	10
Pig muscle 300, bread 300	20
Beef muscle 200, bread 400	25
Heart muscle 200, bread 300	28
Raspberries 250, bread 350	0
Raisins 300, bread 350	25
Apples, 250, bread 350	35
Prunes, 250 bread 350	35
Apricots 200, bread 300	40
Peaches 200, bread 300	40
Bone marrow powder 30, bread 600	25
Beef spleen 200, bread 250	25
Brains 300, bread 300	25
Pig pancreas 250, bread 350	30
Fish liver 150, bread 350	0
Beef liver 300, bread 300	50
Pig kidney 200, bread 350	70
Chicken liver 200, bread 250	75
Chicken gizzard 300, bread 200	85
Beek kidney 250, bread 250	90
Beef liver 400	100

High Iron Diet

80 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 105, Protein 80, Fat 75, Calories 1,415

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread (whole-grain)	60	3 thin slices
Butter	20	2 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%		
Meat (lean)	165	2 servings (5½ oz.)
Bacon	10	2 slices, crisp
Egg	100	
Vegetables, 3% Vegetables, 6%	300	2
Fruit, 5%		
Fruit, 10%, 15–20%	400	3 servings (1½ cups)
Vegetables and fruit, 20%		4 servings

High Iron Diet

80 Gm. Protein
1,400 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit or fruit juice	1 serving	100
Prunes or raisins	1 serving	100
Bacon	2 slices	10
Egg	2	100
Bread (whole-grain)	1 thin slice	20
Butter	½ square	5
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving (2½ oz.)	75
Vegetables	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	½ square	5
Milk	1 glass	200
Peaches or apricots	1 serving	100
DINNER		
Meat	1 large serving (3 oz.)	90
Vegetable	1 serving	100
Salad: vegetable	1 serving	100
Bread (whole-grain)	1 thin slice	20
Butter	1 square	10
Fruit	1 serving	100
Milk	1 glass	200

High Iron Diet

85 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 150, Protein 85, Fat 95, Calories 1,795

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread (whole-grain)	90	3 slices
Butter	40	4 slices
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	30	2 tablespoons
Meat (lean)	150	2 servings (5 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 5%		
Fruit, 10, 15, 20%	400	4 servings
Potato	100	1 serving

High Iron Diet

85 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit or fruit juice	1 serving	100
Prunes or raisins	1 serving	100
Bacon	2 slices	10
Egg	2	100
Bread (whole-grain)	1 slice	30
Butter	1 square	10
Cream, 20%	2 tablespoons	30
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	75
Vegetable	1 serving	100
Bread (whole-grain)	1 slice	30
Butter	1½ squares	15
Peaches or apricots	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	75
Potato	1 serving	100
Vegetable	1 serving	100
Salad: vegetable	1 serving	100
Bread (whole-grain)	1 slice	30
Butter	1½ squares	15
Fruit	1 serving	100
Milk	1 glass	200

High Iron Diet

85 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 175, Protein 85, Fat 130, Calories 2,210

Food	*Gram Weight*	*Household Measure*
Cereal (whole-grain)	105	½ cup
Bread (whole-grain)	90	3 slices
Butter	55	5½ squares
Salad dressing with oil	15	1 tablespoon
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	150	2 servings (5 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10, 15, 20%	400	4 servings
Potato	100	1 serving
Sugar	5	1 teaspoon

High Iron Diet

85 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit or fruit juice	1 serving	100
Prunes or raisins	1 serving	100
Cereal (whole-grain, cooked)	½ cup	105
Bacon	2 slices	10
Egg	2	100
Bread (whole-grain)	1 slice	30
Butter	1½ squares	15
Cream	¼ cup	60
Sugar	1 teaspoon	5
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	75
Vegetable	1 serving	100
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Peaches or apricots	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	75
Potato	1 serving	100
Vegetable	1 serving	100
Salad: vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200

High Iron Diet

90 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 210, Protein 90, Fat 155, Calories 2,595

Food	*Gram Weight*	*Household Measure*
Cereal (whole-grain)	105	½ cup
Bread (whole-grain)	90	3 slices
Butter	60	6 squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	150	2 servings (5 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10, 15, 20%	400	4 servings
Potato	100	1 serving
Sugar	10	2 teaspoons
Dessert	100	1 serving

High Iron Diet

90 Gm. Protein
2,600 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit or fruit juice	1 serving	100
Prunes or raisins	1 serving	100
Cereal (whole-grain, cooked)	½ cup	105
Bacon	2 slices	10
Egg	2	100
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	2 teaspoons	10
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	75
Vegetable	1 serving	100
Salad:		
Vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Peaches or apricots	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 serving	75
Potato	1 serving	100
Vegetable	1 serving	100
Salad:		
Fruit	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread (whole-grain)	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Dessert	1 serving	100

Section B

Conditions in Which Diet Is of Varying Importance

Diseases of Circulation
- Heart
- Hypertension

Febrile Diseases
- Typhoid Fever
- Tuberculosis
- Pneumonia
- Fevers in General

Diseases of Esophagus and Stomach
- Gastritis
- Gastric neurosis
- Hyperchlorhydria
- Achlorhydria and achylia
- Obstructive lesions of esophagus
- Obstructive lesions of stomach

Diseases of the Liver

Diseases of the Gallbladder

Diseases of the Intestines
- Diarrhea
- Flatulence
- Fermentation
- Putrefaction

Diseases of the Intestines (*Continued*)
- Mucous colitis
- Ulcerative colitis
- Diverticulosis and diverticulitis

Food Allergy

Diseases of Urinary Tract
- Infections of urinary tract
- Calculi of urinary tract
- Oxaluria
- Phosphaturia
- Uraturia

Addison's Disease

Hyperinsulinism

Protein and Amino Acids in Nutritional Therapy

Arthritis

Pregnancy and Lactation

Ketogenic Diet

Diet and Skin Diseases

Diet and Dental Caries

Diseases of Circulation

HEART

Nature of Disease

Acute or chronic diseases of the heart, with or without broken compensation

Object of Diet

To reduce cardiac strain to a minimum

Disease of the heart may be endocarditis, myocarditis, one of the heart irregularities, angina pectoris, coronary occlusion or pericarditis.

There are no hard and fast rules for the diet in cardiac disease. It must be adjusted to yield sufficient nourishment and at the same time place the least possible amount of work upon the heart. When heart disease is associated with overweight or obesity, the reduction of the obesity is very important. However, it must be done cautiously and in definite steps rather than by a vigorous continued program until ideal or expected weight is attained.

When the heart disease has developed to a period of decompensation, particularly with an associated edema, efforts are directed toward a reduction of fluids and salt.

Important Factors in Dietary Treatment of Heart Disease

1. Protein: Relatively low
2. Carbohydrates (easily assimilated): In abundance
3. Fat: determined by caloric needs
4. Meals: Small and frequent
5. Energy value: Adequate to maintain normal nutrition

If there is edema, the following also should be observed:

6. Fluid: Restricted
7. Salt: Reduced

These factors are now discussed briefly.

Protein: Relatively Low. A high protein diet is incompatible with cardiac rest. In most cases, a relatively low protein content, approximately 50 Gm., will give less acceleration to the heart action and thus aid in reducing the work of the heart to a minimum.

Carbohydrate (Easily Assimilated): In Abundance. It has been shown that an impaired myocardium responds remarkably to the nutritional value of glucose. An abundance of easily assimilated carbohydrate, therefore, is indicated. This means the use of such forms of sugars as lactose or dextose, honey (fructose), Karo syrup, dextro-maltose, malted milk, foods from carefully treated cereal grains. The ease with which sugar is assimilated and utilized for energy with the least possible effort makes it a very valuable foodstuff in heart disease.

Fat: Determined by Caloric Needs. With limited protein and an abundance of carbohydrate, the amounts of fat are used to regulate the need in energy requirement.

Meals: Small and Frequent. Many attacks of heart disease are precipitated by heavy meals which cause digestive upsets. The importance of this factor should be emphasized, especially in cases of coronary disease, when attacks are frequently precipitated by overeating. The evening meal should be light in all heart disease. The foods should be simple and in small amounts, and at frequent intervals if necessary. Individual idiosyncrasies should be borne in mind.

Energy Value: Adequate to Maintain Nutrition. Adequate caloric value should be prescribed in the diet to maintain the individual at or slightly below the normal weight. In cases of overweight or obesity, reduction is clearly indicated.

Fluid: Restricted if Edema Is Present. When edema is present with heart disease, the total fluid intake should be restricted. The amount depends upon the specific condition met with, but should range from 900 to 1,500 cc. daily. Caution should be used that fluid restriction is not too rigid or prolonged, for some cardiac patients, even with edema, respond better when the fluid intake is more liberal. While tea and coffee may be allowed occasionally, in certain cases of arrhythmias it is well to omit their use.

Salt: Reduced if Edema Is Present. The salt restriction is similar to the restriction in certain forms of nephritis: the salt in the diet should be limited to that contained in the food as it reaches the table, small amounts being used in the preparation of food in cooking.

Directions for Application of Diets

The diet to be used in heart failure with broken compensation depends upon the severity of the individual case.

In the severest case, necessitating bed rest with marked edema, we have outlined Diet 1 containing 45 Gm. of protein, 1,400 calories and low in salt with an approximate fluid content of 1,000 cc. This diet is divided into small and frequent feedings. The average severe case of heart failure will be able to tolerate this regime.

Karell Diet. If the patient with severe decompensation is unable to follow Diet 1 and cannot tolerate anything but liquids, the treatment may be begun with the Karell diet and continued from 2 to 4 days. The Karell diet consists of 200 cc. or about an average of one glass of milk at 8 A.M., 12:00 noon, 4:00 P.M. and 8:00 P.M., thus giving 800 cc. of milk in 24 hours.

Occasionally in cases of anorexia or nausea, the patient may tolerate a diet with less fluid and more solids. The modified Karell diet (p. 415), suggested by Bannick and Smith, has met with success in this type of patient.

As soon as the patient is able to take more nourishment, or in less severe cases of cardiac failure, we suggest Diets 2 or 3 containing 50 Gm. of protein and 1,800 and 2,200 calories, respectively, depending upon the energy requirements and weight desired. Increase or decrease in the protein or caloric content of these diets may be adjusted as described on page 82.

The typical foods to be used and those to be avoided in Diet 1 are the same as those used in the bland diet, page 712.

Foods that tend to produce flatulence, page 454, should be avoided.

Acute Coronary Artery Occlusion

The management of acute coronary occlusion requires absolute rest in bed. If the patient presents the picture of severe shock the body should be kept warm, hot-water bottles being used if necessary. Morphine sulfate should be given in adequate dosage for severe pain. When manifestations of congestive heart

MODIFIED KARELL DIET

		Gm.
BREAKFAST		
Bread (toast)	½ thin slice	10
Fruit, 10%	1 serving	100
Sugar	1 teaspoon	5
Egg	1	50
LUNCHEON		
Bread (toast)	½ thin slice	10
Cream soup	⅔ cup	150
Butter	½ square	5
DINNER		
Bread (toast)	½ thin slice	10
Milk	1 glass	200
Butter	1 square	10
Egg	1	50

failure or auricular fibrillation are present, digitalis should be administered. If cyanosis or other signs of myocardial insufficiency, such as dyspnea, moist râles at the bases of the lungs, rapid feeble heart sounds, gallop rhythm or abnormally low blood pressure, are present, oxygen therapy should be given at once. During the first 24, 48 or 72 hours no food should be urged on the patient. Fluids, to the extent of 1,000 or 1,500 cc. in 24 hours, such as sweetened fruit juices, broth or a small quantity of homogenized milk, may be given by mouth. If nausea or vomiting occurs, bits of cracked ice or sips of carbonated water may be offered. The patient should not be allowed to feed himself or exert himself in any manner.

After several days the diet is gradually increased by the addition of cereals, strained vegetables, purées, toast, homogenized milk, custard and ice cream. The policy of 5 small meals a day, with a minimum of fluids at mealtime, is far better than any one large meal. Every effort should be made to avoid all flatulent foods. Embarrassment of cardiac action may result from abdominal distention, either directly by upward displacement of the diaphragm and consequent diminution of vital capacity or indirectly by reflex action, as in the so-called gastrocardiac syndrome. In an experimental study on dogs, Gilbert, LeRoy and Fenn found that distention of the stomach or the peritoneal cavity under light anesthesia initiated in many instances a vagovagal reflex with a resultant decrease in the blood flow through the circumflex branch of the left coronary artery. The bowels should be kept regular by the use of mild laxatives or oil enemas so as to prevent the necessity of straining at stool.

A diet of 1,400 calories, consisting of 135 Gm. of carbohydrate, 45 Gm. of protein and 75 Gm. of fat and containing adequate amounts of vitamins and minerals (Diet 1), has been used with success. This diet is used for from four to six weeks, the number of calories being gradually increased thereafter to 1,800 (Diet 2) and, finally, to 2,200 (Diet 3). Through prolonged undernutrition and low protein, with lessened specific dynamic action, the basal metabolic rate is lowered and the work of the heart diminished to a somewhat greater degree than can be achieved by rest in bed only.

Cardiac Diet 1

45 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 135, Protein 45, Fat 75, Calories 1,395

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	60	3 thin slices
Butter	20	2 squares
Salad dressing with oil		
Milk	500	2½ glasses
Cream, 20%	60	¼ cup
Meat (lean)		
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% } purée	100	½ cup
Fruit, 10% juice	300	1½ glasses
Fruit, 10–15%, purée	100	½ cup
Vegetables and fruit, 20%		
Custard or simple pudding	100	1 serving

Cardiac Diet 1

45 Gm. Protein
1,400 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit juice, 10%	¼ glass	50
Cereal (cooked)	½ cup	105
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	½ square	5
Cream, 20%	¼ cup	60
Beverage—coffee substitute		
10:00 A.M. Fruit juice	½ glass	100
LUNCHEON		
Soup:		
Vegetable purée, 3% or 6%	½ cup	100
Milk	½ glass	100
Butter	½ square	5
Egg or egg substitute	1	50
Bread (toast)	1 thin slice	20
Butter	½ square	5
Fruit purée, 10% or 15%	½ cup	100
3:00 P.M. Milk	1 glass	200
DINNER		
Fruit juice, 10%	¼ glass	
Milk toast:		
Milk	1 glass	200
Toast	1 thin slice	20
Butter	½ square	5
Custard	½ cup	100
Bedtime. Fruit juice	½ glass	100

Cardiac Diet 2

50 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 210, Protein 50, Fat 85, Calories 1,805

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	35	3½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings (1½ cups)
Fruit, 10% or 15%	300	3 servings
Potato or substitute	150	2 small servings (¾ cup)
Sugar and jam	30	2 tablespoons
Dessert	100	1 serving

Cardiac Diet 2

50 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit juice, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	1 square	10
Sugar	1 tablespoon	15
Jam	1 tablespoon	15
Cream, 20%	¼ cup	60
Beverage—coffee substitute		
LUNCHEON		
Meat	1 small serving	45
Potato or substitute	1 small serving	75
Vegetable, 3% or 6%	2 servings	200
Bread	1 thin slice	20
Butter	1½ squares	15
Dessert	1 serving	100
Milk	1 glass	200
3:00 P.M. Fruit, 10% or 15%	1 serving	100
DINNER		
Potato or substitute	1 small serving	75
Vegetable, 3% or 6%	1 serving	100
Bread	1 thin slice	20
Butter	1 square	10
Fruit, 10% or 15%	1 serving	100
Milk	1 glass	200

Cardiac Diet 3

50 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 230, Protein 50, Fat 120, Calories 2,200

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	55	5½ squares
Salad dressing with oil	15	1 tablespoon
Milk	300	1½ glasses
Cream, 20%	60	¼ cup
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings (1½ cups)
Fruit, 10% or 15%	300	3 servings
Potato or substitute	150	2 small servings (¾ cup)
Sugar and jam	40	2 large tablespoons
Dessert	100	1 serving

Cardiac Diet 3

50 Gm. Protein
2,200 Calories

Suggested Distribution of the Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit juice, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 slice	30
Butter	1½ squares	15
Sugar	2 teaspoons	10
Jam	2 tablespoons	30
Cream, 20%	¼ cup	60
Beverage—coffee substitute		
DINNER		
Meat	1 small serving	45
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Salad: vegetable	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Dessert	1 serving	100
Milk	¾ glass	150
SUPPER		
Potato or substitute	1 small serving	75
Vegetable, 6%	1 serving	100
Salad:		
Fruit, 10% or 15%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit, 10% or 15%	1 serving	100
Milk	¾ glass	150

Diseases of Circulation *(Continued)*

HYPERTENSION

Nature of Condition

Elevation of blood pressure above normal

Object of Diet

To reduce cardiac strain to a minimum

Hypertension is a disease complex of unknown etiology. It occurs at any age, but probably most frequently between the ages of 40 and 50. There are many types of individuals with hypertension, and obesity is one of the commonest predisposing causes. Hypertension usually is rather insidious in its onset; there may not be any noticeable symptoms, its discovery being made in the course of a routine examination. It is ordinarily a steadily progressive affair accompanied in the late stages by changes in the heart, the kidneys, the brain or the blood vessels.

When hypertension remains constant for years without fluctuating and the cardiac and the renal functions remain good, without evidence of actual retinitis, it is of a benign type. This type is more common than the malignant type.

The malignant hypertension develops rather suddenly, pursues a rapid course with definite associated pathology of heart, fundus, kidneys and arteries. Death takes place usually in from eight months to two years. The condition is not a disease of old age; it may occur in youth or middle age.

Inasmuch as the malignant form of hypertension has associated pathology, the diet therapy should be considered primarily from the standpoint of the associated disease.

Important Factors in Dietary Treatment of Hypertension

1. Calories: To maintain normal weight
2. Protein: Normal
3. Salts: No excess
4. Condiments: Restricted.

These factors are now discussed briefly.

Calories: To Maintain Normal Weight. The calories of the diet should be determined by the patient's weight. If the patient is overweight or obese, the total calories should be kept at a point below maintenance so that the weight loss will be gradual. More good may be accomplished for an individual with hypertension and obesity by reducing the obesity than from any other single effort. Too rapid a weight loss is dangerous. If the patient's weight is normal, maintenance calories should be provided.

Protein: Normal. In hypertension without complications, there is no justification for giving a low protein diet. However, no excess of protein should be used. All forms of protein may be given in normal amounts. Approximately 1 Gm. per kilogram is given, according to the desired weight.

Salts: No Excess. Unless there are complications with hypertension, it is questionable whether salt restriction is indicated. We suggest no excess salt.

Condiments: Restricted. We would emphasize the restriction of condiments. To avoid stimulation, alcohol should be prohibited, and tea, coffee and cocoa should be used only in limited amounts, if not entirely restricted.

DIRECTIONS FOR APPLICATION OF DIETS

We have suggested three diets containing 60 Gm. of protein and 1,400, 1,800 and 2,200 calories, respectively. The protein or the caloric content may be increased or decreased as discussed on page 82. In most respects it will be noted that these diets are essentially normal, with the exception of the factors mentioned above.

60 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 145, Protein 60, Fat 65, Calories 1,405

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	90	3 thin slices
Butter	20	2 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	45	3 tablespoons
Meat (lean)	60	1 serving (2 oz.)
Bacon*		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings (1½ cups)
Fruit, 10–15%	300	3 servings
Potato or substitute	100	1 serving (½ cup)

* One or two slices of crisp bacon if desired.

60 Gm. Protein
1,400 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	½ cup	105
Egg	1	50
Bread (toast)	1 slice	30
Butter	½ square	5
Cream, 20%	3 tablespoons	45
Beverage—coffee substitute		
LUNCHEON		
Meat	1 serving	60
Vegetables, 3% or 6%	2 servings	200
Bread	1 slice	30
Butter	1 square	10
Fruit, 10%	1 serving	100
Milk	1 glass	200
DINNER		
Egg or egg substitute	1 serving	50
Potato or substitute	1 serving	100
Vegetables, 3% or 6%	1 serving	100
Bread	1 slice	30
Butter	½ square	5
Fruit, 10% or 15%	1 serving	100
Milk	1 glass	200

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 175, Protein 60, Fat 95, Calories 1,795

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	50	5 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon*		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings (1½ cups)
Fruit, 10–15%	300	3 servings
Potato or substitute	100	1 serving (½ cup)
Sugar or jam	15	1 tablespoon

* One or two slices of crisp bacon if desired.

60 Gm. Protein
1,800 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 slice	30
Butter	1 square	10
Sugar or Jam	1 tablespoon	15
Cream, 20%	¼ cup	60
Beverage—coffee substitute		
LUNCHEON		
Meat	1 serving	60
Vegetables, 3% or 6%	2 servings	200
Bread	1 slice	30
Butter	2 squares	20
Fruit, 10% or 15%	1 serving	100
Milk	1 glass	200
DINNER		
Egg or egg substitute	1 serving	50
Potato or substitute	1 serving	100
Vegetable, 3% or 6%	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Fruit, 10% or 15%	1 serving	100
Milk	1 glass	200

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 205, Protein 60, Fat 125, Calories 2,185

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil	15	1 tablespoon
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon*		
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10–15%	300	3 servings
Potato or substitute	100	1 serving
Sugar or jam	15	1 tablespoon
Dessert	100	1 serving

* One or two slices of crisp bacon if desired.

60 Gm. Protein
2,200 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Sugar or Jam	1 tablespoon	15
Cream, 20%	¼ cup	60
Beverage—coffee substitute		
LUNCHEON		
Meat	1 serving	60
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Dessert	1 serving	100
Milk	1 glass	200
DINNER		
Egg or egg substitute	1 serving	50
Potato or substitute	1 serving	100
Vegetable	1 serving	100
Salad: fruit	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200

Febrile Diseases

TYPHOID FEVER

Nature of Disease

Subacute infectious disease involving the lymphoid tissue

Object of Diet

To furnish a high caloric, nonirritating diet

Typhoid fever is a subacute infectious disease caused by the Bacillus typhosus. The infection attacks essentially the lymphoid tissues of the body, being particularly marked by enlargement of the spleen and hyperplasia and ulceration of Peyer's patches in the intestine. Clinically it has a gradual onset; peculiar temperature curve; rose-colored spots; prostration (referred to as "typhoid state"); Widal reaction of serum; and a liability to complications of intestinal hemorrhage and perforation, pneumonia, ulcerative laryngitis and venous thrombosis.

Shaffer and Coleman revolutionized the treatment of typhoid fever by introducing the high caloric diet, which also has lowered the death rate and reduced the number of complications and the severity of the symptoms.

IMPORTANT FACTORS IN DIETARY TREATMENT OF TYPHOID FEVER

1. Calories: High—from 3,000 to 6,000 a day
2. Carbohydrate: High
3. Protein: Slightly above normal
4. Fat: Large amount
5. Fluids: In abundance
6. Feedings: Small and frequent

These factors are now discussed briefly.

Calories: High—from 3,000 to 6,000 a Day. The high caloric intake in typhoid is a most important phase of the treatment. The amount of food can be determined only by each patient's individual needs, although the appetite should not be considered. Patients in the early stage of the disease should be given a liquid diet. It is difficult to give more than from 2,500 to 3,000 calories per day in the early stage. Gradually progress may be made to a soft diet and in convalescence the patient will readily take from 4,000 to 6,000 calories a day.

Carbohydrate: High. Carbohydrate should furnish a large part of the diet. Such foods as cooked cereals, toast, honey, milk, sugar, fruits, rice and ice cream should be included.

Protein: Slightly Above Normal. There is increased destruction of protein in typhoid fever. The protein should be slightly above normal. The best way to give protein is in the form of milk, from one to two quarts daily. Milk can be given in various ways, with lime water or cream added or mixed with barley flour, or as malted milk, buttermilk, peptonized milk, cocoa and eggnog. Next to milk in protein value are eggs. No meat is used as long as there is any fever.

Fat: Large Amount. Fats are used in rather large amounts in the form of cream, butter and eggs. Unless diarrhea develops, these are taken with much benefit.

Fluids: In Abundance. Fluids are given in abundance at regular intervals day and night.

Feedings: Small and Frequent. Small and frequent feedings are given every two hours in the daytime and every four hours at night.

CARE OF THE MOUTH AND THE NOSE

Although lack of appetite is rather characteristic at the onset and during the height of the disease, a great deal may be done toward aiding the appetite by proper care of the mouth and the nose. The mouth should be kept very clean by scrubbing the teeth and washing out the mouth with some pleasant antiseptic mouthwash before and after each feeding. Chewing gum is sometimes a help.

COMPLICATIONS

If hemorrhage from the intestine occurs, all food should be stopped. The patient is kept completely at rest, with an icebag on the abdomen. Only small amounts of cracked ice should be given by mouth. If there is no bleeding for twenty-four hours, small amounts of cold milk may be given cautiously.

Perforation, of course, requires immediate discontinuance of food and surgical intervention may be necessary.

DIRECTIONS FOR APPLICATION OF DIETS

Four diets are suggested for typhoid fever. In the first stages of the disease there may be difficulty in persuading the patient to take from 2,600 to 3,000 calories. During convalescence, however, there will be no difficulty in giving from 4,000 to 6,000 calories.

Since the appetite is no guide to the caloric needs of an individual, an effort must be made by careful nursing to get the patient to take at least 2,600 calories. A few patients may be able to take more nourishment. This may be accomplished by increasing the proportions of foods suggested.

The patient is first placed on the liquid diet containing 65 Gm. of protein with 2,600 calories. From this point, depending upon the patient's progress, one may gradually increase from a liquid to a soft diet and then to a light diet. As soon as the convalescent stage is reached, when there is ordinarily a ravenous appetite, one should give the high-calorie diet containing 100 Gm. of protein with 4,000 calories. It may be necessary to give as much as 6,000 calories, which can be accomplished by a proportional increase in the amount of the foods suggested and by feedings between meals and at bedtime.

The typical foods to emphasize and those to avoid in the soft and light diet for typhoid-fever patients are the same as those used in the bland diet, page 712.

COMPLICATIONS IN HIGH CALORIC FEEDING

The administration of a high caloric diet in typhoid fever may precipitate complications affecting the gastro-intestinal tract. They are chiefly nausea, vomiting, diarrhea and tympanitis. If the food mixtures are too rich, with too large a preponderance of fats and carbohydrates for patients with special idiosyncrasies, nausea or vomiting may result. They may result also if food is pushed too rapidly. If nausea or vomiting does upset the digestive mechanism, the food intake must be diminished and the offending foods omitted from the diet. The commonest cause of tympanitis is the excessive use of lactose. Eggs and cream occasionally are responsible. Diarrhea is apt to be the result of too much fat, especially in rich cream.

Liquid Diet

---

65 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 295, Protein 65, Fat 130, Calories 2,610

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread		
Butter		
Salad dressing with oil		
Milk	1,200	6 glasses
Cream, 20%	300	1½ glasses
Meat (lean)		
Bacon		
Egg	150	3
Vegetables, 3% puréed	100	½ cup
Vegetables, 6% puréed		
Vegetables, 15% puréed		
Fruit, 10% juice	800	4 glasses
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		
Sugar or lactose	120	½ cup

Liquid Diet

65 Gm. Protein
2,600 Calories

Suggested Distribution of Total Food Allowance for One Day

A.M. 4:00	Fruit juice	1 glass	200
	Sugar or lactose	1 tablespoon	15
6:00	Milk	1 glass	200
8:00	Breakfast:		
	Cereal gruel:		
	Cooked cereal, strained	⅓ cup	70
	Cream	about ½ cup	100
	Sugar or lactose	2 tablespoons	30
	Fruit juice	1 glass	200
10:00	Eggnog:		
	Milk	1 glass	200
	Egg	1	50
	Sugar or lactose	1 tablespoon	15
	Vanilla		
M. 12:00	Dinner:		
	Cream soup:		
	Puréed vegetables	½ cup	100
	Cream	about ½ cup	100
	Salt		
	Fruit juice	½ glass	100
P.M. 2:00	Milk	1 glass	200
4:00	Eggnog:		
	Milk	1 glass	200
	Egg	1	50
	Sugar or lactose	1 tablespoon	15
	Vanilla		
	Fruit juice	½ glass	100
6:00	Supper:		
	Cereal gruel:		
	Cooked cereal	⅓ cup	70
	Cream	about ½ cup	100
	Sugar or lactose	2 tablespoons	30
	Fruit juice	1 glass	200
8:00	Milk	1 glass	200
A.M. 12:00	Eggnog:		
	Milk	1 glass	200
	Egg	1	50
	Sugar or lactose	1 tablespoon	15
	Vanilla		

Soft Diet

70 Gm. Protein
3,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 335, Protein 70, Fat 155, Calories 3,015

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	40	4 squares
Salad dressing with oil		
Milk	1,000	5 glasses or 1 quart
Cream, 20%	240	1 cup or ½ pint
Meat (lean)		
Bacon		
Egg	150	3
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	150	2 small servings (¾ cup)
Fruit, 10% juice	800	4 glasses
Vegetables and fruit, 15%		
Potato or substitute	75	1 small serving
Dessert	100	1 serving
Sugar or lactose	75	5 tablespoons

Soft Diet

70 Gm. Protein
3,000 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

A.M. 4:00	Fruit juice	1 glass	200
	Sugar or lactose	1 tablespoon	15
6:00	Milk	1 glass	200
8:00	Breakfast:		
	Fruit juice	½ glass	100
	Cereal	⅔ cup	140
	Egg	1	50
	Toast	1 slice	30
	Butter	1 square	10
	Cream, 20%	¼ cup	60
	Sugar or lactose	2 tablespoons	30
	Beverage—coffee, tea or coffee substitute		
10:00	Eggnog:		
	Milk	1 glass	200
	Egg	1	50
	Sugar or lactose	1 tablespoon	15
	Vanilla		
M. 12:00	Dinner:		
	Cream soup:		
	Puréed vegetable	about ½ cup	75
	Cream	⅓ cup (3 oz.)	90
	Baked potato	1 small serving	75
	Toast	1 slice	30
	Butter	2 squares	20
	Simple dessert*	1 serving	100
	Fruit juice	½ glass	100
P.M. 2:00	Fruit juice	1 glass	200
	Sugar or lactose	1 tablespoon	15
4:00	Milk	1 glass	200
6:00	Supper:		
	Fruit juice	½ glass	100
	Cream soup:		
	Puréed vegetable	about ½ cup	75
	Cream	about ⅓ cup	90
	Egg	1	50
	Toast	1 slice	30
	Butter	1 square	10
	Milk	1 glass	200
8:00	Fruit juice	½ glass	100
A.M. 12:00	Milk	1 glass	200

* Plain pudding, custard, ice cream or gelatin desserts.

Light Diet

70 Gm. Protein
3,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 325, Protein 70, Fat 160, Calories 3,020

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil		
Milk	600	3 glasses
Cream, 20%	300	1½ glasses
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15%	150	2 small servings
Fruit, 10%, juice	800	4 glasses
Fruit, 15–20%	200	2 servings
Potato or substitute	150	2 small servings (¾ cup)
Sugar or lactose	60	4 tablespoons

Light Diet

---

70 Gm. Protein
3,000 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

A.M. 6:00	Milk	¾ glass	150
	Cream	¼ glass	50
8:00	Breakfast:		
	Orange juice	1 glass	200
	Cereal (cooked)	⅔ cup	140
	Egg	1	50
	Toast	1 slice	30
	Butter	2 squares	20
	Cream, 20%	½ glass	100
	Sugar or lactose	2 tablespoons	30
	Beverage—coffee, tea or coffee substitute		
10:00	Fruit juice	1 glass	200
	Sugar or lactose	1 tablespoon	15
M. 12:00	Dinner:		
	Meat	1 serving	60
	Potato	1 small serving	75
	Vegetable	1 small serving	75
	Toast	1 slice	30
	Milk	1 glass	200
	Butter	2 squares	20
	Cream, 20%	¼ glass	50
	Cooked fruit	1 serving	100
P.M. 2:00	Fruit juice	1 glass	200
4:00	Milk	¾ glass	150
	Cream, 20%	¼ glass	50
6:00	Supper:		
	Egg or egg substitute	1	50
	Potato or substitute	1 small serving	75
	Vegetable	1 small serving	75
	Toast	1 slice	30
	Butter	2 squares	20
	Milk	¾ glass	150
	Cream, 20%	¼ glass	50
	Cooked fruit	1 serving	100
8:00	Sugar or lactose	1 tablespoon	15
	Fruit juice	1 glass	200

Full Diet

100 Gm. Protein
4,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 340, Protein 100, Fat 250, Calories 4,010

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	120	4 slices
Butter	110	11 squares
Salad dressing with oil	30	2 tablespoons
Milk	600	3 glasses
Cream, 20%	240	1 cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15%	400	4 servings
Fruit, 10–15%	300	3 servings
Potato or substitute	200	2 servings
Sugar, jelly or jam	75	5 tablespoons
Dessert	200	2 servings

Full Diet

100 Gm. Protein
4,000 Calories

Suggested Distribution of Total Food Allowance for One Day

			Gm.
	BREAKFAST		
A.M. 8:00	Fruit	1 serving	100
	Cereal (cooked)	⅔ cup	140
	Egg	2	100
	Bacon	3 slices	15
	Toast	2 slices	60
	Butter	3 squares	30
	Cream	½ cup	120
	Sugar	2 tablespoons	30
	Jelly or jam	3 tablespoons	45
	Beverage—coffee, tea or coffee substitue.		
	LUNCHEON		
M. 12:00	Meat	1 serving	60
	Potato or substitute	1 serving	100
	Vegetables	2 servings	200
	Salad:		
	Fruit	1 serving	100
	Salad dressing	1 tablespoon	15
	Butter	1 slice	30
	Bread	4 squares	40
	Milk	1 glass	200
	Dessert	1 serving	100
	Cream	¼ cup	60
P.M. 3:00	Milk	1 glass	200
	DINNER		
6:00	Meat	1 serving	60
	Potato or substitute	1 serving	100
	Vegetables	2 servings	200
	Salad:		
	Fruit	1 serving	100
	Salad dressing	1 tablespoon	15
	Bread	1 slice	30
	Butter	4 squares	40
	Milk	1 glass	200
	Dessert	1 serving	100
	Cream, 20%	¼ cup	60

Febrile Diseases *(Continued)*

TUBERCULOSIS

Nature of Disease

A chronic infectious disease caused by the tubercle bacillus

Object of Diet

To maintain body at its optimum normal weight or slightly above

Tuberculosis in man is an infectious disease caused by the Bacillus tuberculosis. It is characterized clinically by alternating periods of symptomatic activity and quiescence. All tissues may be attacked by this disease, but the pulmonary type of tuberculosis comprises the great majority of cases. Dietary regulation alone is of little aid without combining rest, fresh air, sunshine and contentment.

Important Factors in Dietary Treatment of Tuberculosis

1. Calories: Ample but not excessive
2. Fat: Generous amounts
3. Protein: Moderate amount
4. Carbohydrate: Moderate restriction
5. Minerals and vitamins: In abundance

These factors are now discussed briefly.

Calories: Ample But Not Excessive. The caloric intake in tuberculosis should be ample to maintain the body weight at the best normal or slightly above normal standard for the individual. In the past the treatment was generally a vigorous attempt to force food because the disease was generally associated with weight loss and emaciation. The present-day belief is against overfeeding. In this respect attention should be called to the modern practice of avoiding the time-honored effort to feed the patient excessive amounts of milk and eggs. The total intake should be given in well-balanced meals and forced feeding should be avoided.

Fat: Generous Amounts. Generous amounts of fat, especially butter and cream, should be incorporated up to the patient's digestive capacity. Fat increases but little the respiratory volume.

Protein: Moderate Amount. Protein destruction is not so great in tuberculosis as it is in typhoid fever. Protein should be from 1 to 1½ Gm. per kilogram of normal body weight. One quart of milk should be included in the diet each day. Eggs, poultry, fish and meat should make up the remainder of protein.

Carbohydrate: Moderate Restriction. There should be a moderate restriction of carbohydrate, since the ingestion of carbohydrate causes an increase in the respiratory volume due to the increase in carbon-dioxide elimination.

Minerals and Vitamins: In Abundance. Minerals and vitamins should be supplied liberally. Foods high in calcium and in vitamin D are indicated. The need for a well-balanced diet is more urgent in a person with tuberculosis than in one in health. There should be an abundance of green vegetables, fruit juices and tomatoes, as well as milk.

DIRECTIONS FOR APPLICATION OF DIETS

Two diets are outlined for the treatment of tuberculosis. The first diet—75 Gm. of protein and 2,600 calories—is a light one for the patient at bed rest. The second diet, containing 80 Gm. of protein with 2,800 calories, is for the ambulatory patient.

Increase or decrease in the protein or caloric content can be made according to the discussion on page 82.

The typical foods to emphasize and those to avoid in the treatment of tuberculosis with chronic fever and bed rest are the same as those used in the bland diet, page 712.

Chronic Fever—Bed Rest

75 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 215, Protein 75, Fat 160, Calories 2,600

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	55	5½ squares
Salad dressing with oil		
Milk	1,000	5 glasses or 1 quart
Cream, 20%	200	1 glass
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	200	2 servings (1 cup)
Fruit, 10–15%, juice or purée	200	2 servings
Potato or substitute	75	1 small serving
Dessert	100	1 serving

Chronic Fever—Bed Rest

75 Gm. Protein
2,600 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

				Gm.
		BREAKFAST		
A.M.	8:00	Fruit juice	½ glass	100
		Cereal (cooked)	⅔ cup	140
		Egg	1	50
		Toast	1 slice	30
		Butter	1 square	10
		Cream, 20%	½ glass	100
		Beverage—coffee substitute		
	10:00	Milk	1 glass	200
		DINNER		
M.	12:00	Cream soup:		
		Puréed vegetable	½ cup (1 serving)	100
		Cream, 20%	½ glass	100
		Salt		
		Meat	1 small serving	45
		Potato	1 small serving	75
		Bread	1 slice	30
		Butter	2 squares	20
		Puréed fruit	½ cup	100
		Milk	1 glass	200
P.M.	3:00	Milk	1 glass	200
		SUPPER		
	6:00	Egg or substitute	1	50
		Puréed vegetable	1 serving	100
		Toast	1 slice	30
		Butter	2½ squares	25
		Simple pudding	1 serving	100
		Milk	1 glass	200
	8:00	Milk	1 glass	200

Chronic Fever—Ambulatory Diet

80 Gm. Protein
2,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 230, Protein 80, Fat 175, Calories 2,815

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	75	7½ squares
Salad dressing with oil		
Milk	1,000	5 glasses or 1 quart
Cream, 20%	200	1 glass
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15%	300	3 servings (1½ cups)
Fruit, 10–15%	300	3 servings
Potato or substitute	75	1 small serving
Simple dessert	100	1 serving
Sugar	10	2 teaspoons

Chronic Fever—Ambulatory Diet

80 Gm. Protein
2,800 Calories

Suggested Distribution of Total Food
Allowance for One Day

				Gm.
		BREAKFAST		
A.M.	8:00	Fruit	1 serving	100
		Cereal (cooked)	⅔ cup	140
		Egg	1	50
		Toast	1 slice	30
		Butter	2 squares	20
		Cream	½ glass	100
		Sugar	2 teaspoons	10
		Beverage—coffee substitute		
	10:00	Milk	1 glass	200
		DINNER		
M.	12:00	Cream soup:		
		Puréed vegetable	½ cup	100
		Cream, 20%	½ glass	100
		Salt		
		Meat	1 small serving	45
		Vegetable	1 serving	100
		Salad: fruit	1 serving	100
		Bread	1 slice	30
		Butter	2½ squares	25
		Dessert	1 serving	100
		Milk	1 glass	200
P.M.	3:00	Milk	1 glass	200
		SUPPER		
	6:00	Egg	1	50
		Potato or substitute	1 small serving	75
		Vegetable	1 serving	100
		Bread	1 slice	30
		Butter	3 squares	30
		Milk	1 glass	200
		Fruit	1 serving	100
	8:00	Milk	1 glass	200

Febrile Diseases *(Continued)*

PNEUMONIA

Nature of Disease

Acute infectious disease with lobar or lobular inflammation of the lungs

Object of Diet

To give nourishment that requires the least possible exertion for patient

Pneumonia is one of the most common and dangerous of all acute infectious diseases. This disease has as its chief manifestation either a lobar or lobular inflammation of the lungs. The illness runs a comparatively short but stormy course with severe general intoxication.

IMPORTANT FACTORS IN DIETARY TREATMENT OF PNEUMONIA

1. Fluids: Proper intake
2. Food: Small quantities at frequent intervals
3. Solid foods: Not necessary
4. Protein: Needs may vary from 50 to 60 Gm. per day
5. Caloric intake: Not important

These factors are now discussed briefly.

Fluids: Proper Intake. Thirst, as a rule, is increased as a result of the disease. The amount of fluid intake in any fever is of great importance. Woodyatt and others have shown that water balance has a relationship to fever. The average patient probably should take between 3,000 and 4,000 cc. of fluids a day. The best way to give fluids is by cold water or fruit juices made from oranges, lemons or grapefruit. Carbonated waters are often useful when there is gastric disturbance. Alcoholic liquor may be useful in patients with pneumonia, especially if they are accustomed to alcohol. Large amounts at a time are to be avoided. When fluids are pushed to great excess, the individual may develop undesirable symptoms.

Food: Small Quantities at Frequent Intervals. Small quantities of food should be given at frequent intervals so that it will require the least possible exertion on the part of the patient to take it.

Solid Foods: Not Necessary. Solid foods are not necessary. Solid foods which are suitable in health become burdensome to the pneumonia patient and, if given or forced, may result in nausea, vomiting or diarrhea.

Protein: Needs Vary. Pneumonia differs from other febrile diseases in that there is a great loss of nitrogen after the crisis. There may be a slight increase of nonprotein nitrogen in the blood at the beginning of the disease. The protein intake should vary between 50 and 60 Gm. per day and is derived chiefly from milk and eggs. Meats are withheld during the fever, except, perhaps, as meat extractives may be present in broth.

Caloric Intake: Not Important. In most fevers the metabolic processes are increased but in pneumonia there is no great need to be concerned about the caloric intake since from approximately 1,800 to 2,000 calories are adequate during the acute stage.

DIRECTIONS FOR APPLICATION OF DIETS

Two diets are suggested for pneumonia, one of which is a liquid diet containing 50 Gm. of protein and 1,800 calories. This diet, or one closely approximating it, should be used until the patient can be induced to take more solid food during convalescence. For this purpose we have suggested a convalescent diet of 60 Gm. protein and 2,200 calories. From this point on a gradual increase is made to a full normal diet.

Acute Fever—Liquid Diet

50 Gm. Protein
1,800 Calories

Quantitative and Estimated Quantitative
Total Food Allowance for One Day

Carbohydrate 170, Protein 50, Fat 100, Calories 1,780

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread		
Butter		
Salad dressing with oil		
Milk	1,000	5 glasses, 1 quart
Cream, 20%	240	1 cup or ½ pint
Meat (lean)		
Bacon		
Egg	100	2
Vegetables, 3% } puréed Vegetables, 6% } puréed Vegetables, 15% } puréed	75	1 small serving
Fruit, 10%, juice	600	3 glasses
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		
Sugar or lactose	30	2 tablespoons

Acute Fever—Liquid Diet

50 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

				Gm.
		BREAKFAST		
A.M.	8:00	Fruit juice	1 glass	200
		Cereal gruel:		
		Cooked cereal	½ cup	105
		Cream, 20%	½ cup	120
		Sugar or lactose	1 tablespoon	15
		Salt		
	10:00	Milk	1 glass	200
		DINNER		
M.	12:00	Fruit juice	½ glass	100
		Cream soup:		
		Puréed vegetable	½ cup, scant	75
		Cream, 20%	½ cup	120
		Salt		
		Milk	1 glass	200
P.M.	3:00	Eggnog:		
		Milk	1 glass	200
		Egg	1	50
		Sugar or lactose	1 teaspoon	5
		Vanilla		
		Fruit juice	½ glass	100
		Sugar or lactose	2 teaspoons	10
		SUPPER		
	6:00	Egg broth:		
		Milk	1 glass	200
		Egg	1	50
		Salt		
		Fruit juice	1 glass	200
	8:00	Milk	1 glass	200

Acute Fever—Convalescent Diet

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 240, Protein 60, Fat 110, Calories 2,190

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	60	3 thin slices
Butter	50	5 squares
Salad dressing with oil		
Milk	600	3 glasses
Cream, 20%	60	¼ cup
Meat* (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15%	150	2 small servings (¾ cup)
Fruit, 10%, juice	600	3 glasses
Vegetables and fruit, 15%	100	1 serving
Potato or substitute	150	2 small servings (¾ cup)
Sugar or lactose	15	1 tablespoon
Dessert	100	1 serving

* Chicken, fish or scraped beef.

Acute Fever—Convalescent Diet

60 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		BREAKFAST		
				Gm.
A.M.	8:00	Fruit juice	1 glass	200
		Cooked cereal	⅔ cup	140
		Egg	1	50
		Toast	1 thin slice	20
		Butter	1 square	10
		Cream, 20%	¼ cup	60
		Sugar or lactose	1 tablespoon	15
	10:00	Fruit juice	1 glass	200
		DINNER		
M.	12:00	Meat*	1 small serving	45
		Potato	1 small serving	75
		Puréed vegetable	1 small serving	75
		Toast	1 thin slice	20
		Butter	2 squares	20
		Dessert, simple	1 serving	100
		Milk	1 glass	200
P.M.	3:00	Fruit juice	1 glass	200
		SUPPER		
	6:00	Egg or egg substitute	1	50
		Potato or substitute	1 small serving	75
		Puréed vegetable	1 small serving	75
		Toast	1 thin slice	20
		Butter	2 squares	20
		Cooked fruit	1 serving	100
		Milk	1 glass	200
	8:00	Milk	1 glass	200

* Chicken, fish or scraped beef.

FEVERS IN GENERAL

The diet for any patient suffering from fever due to any infectious disease other than those presented may be selected from the diets suggested for the three febrile diseases just discussed. Only slight adjustment should be required to meet the individual case. In any acute fever one can first use the liquid diet, pages 448 and 449. Whenever there is difficulty in getting the patient to take the required amount of nourishment it is a good plan merely to keep a pitcher of ice-cold fruit juices by the bedside and give small amounts frequently in the place of water. Sugar or lactose may be added to the fruit juices. This may be followed by the convalescent diet (pages 450 and 451) as soon as the fever subsides or the condition of the patient justifies its use.

The type and the chronicity of the febrile disease in question will determine which one of the diets suggested for the three diseases is to be selected.

Diseases of Esophagus and Stomach

GASTRITIS

Nature of Disease

Irritation of stomach. This may be of primary gastric origin or it may be secondary to disease elsewhere

Object of Diet

To promote rest and relieve irritation by proper selection of food

Gastric irritation is a symptom complex which may be of primary gastric origin or secondary to a pathologic condition elsewhere. The gastritis may be due to excessive overindulgence in alcohol, to the use of irritating drugs, to gross errors in diet or to the toxins of an acute infectious disease; or it may be a manifestation of gastric neurosis or a phase of an associated disorder of the gallbladder, the liver or the cardiovascular system.

Important Factors in Dietary Treatment of Gastric Irritations

1. Cause of irritation: Should be removed
2. Stomach: Absolute rest
3. Foods: Nonirritative
4. Feedings: Small
5. All alcohol and condiments: Should be avoided

Directions for Application of Dietary Treatment of Acute Gastritis

The first important object in the treatment of acute gastritis is to give rest to the irritated parts and to remove the cause if it is known. This may be accomplished by giving no food, thereby affording the stomach absolute rest for from twenty-four to forty-eight hours.

In order to prepare the stomach for food, lavage may be necessary, warm water with a small amount of soda bicarbonate being used. Special care should be taken in this connection if the patient has a gastric neurosis. After one or two days of resting the stomach, food may be started. Milk is probably the best food to begin with, and the feedings should be small and frequent. Cereals, eggs, toast, fruit juices, cooked fruit, puréed vegetables and simple desserts should be added gradually. With the addition of a small serving of very tender meat, a bland, nonirritating diet, such as that presented on pages 456 and 457, should be followed for about two weeks, depending upon the patient's symptoms. Foods that increase or stimulate gastric acidity are to be avoided; for example, acid foods, coarse foods, alcoholic beverages, condiments and all meats. The manner of preparation of food is important. The foods should be boiled, baked or broiled. All fried and greasy foods must be avoided. Foods must be carefully masticated. One should omit the foods that tend to cause flatulence, such as cabbage, sauerkraut, Brussels sprouts, cauliflower, turnips, rutabaga, etc.

Typical foods allowed and those to be avoided in the treatment of gastritis are found on page 712.

Foods Tending to Produce Flatulence

Vegetables:

- Beans, especially dried
- Broccoli
- Brussels sprouts
- Cabbage
- Cauliflower
- Corn
- Cucumber
- Garlic
- Lentils
- Onions
- Peas, fresh and dried
- Peppers
- Potatoes
- Radishes
- Rutabaga
- Sauerkraut
- Swiss chard
- Turnips

Fruits:

- Apples, raw
- Melons, especially cantaloupe and watermelon
- Raisins

Sweets:

- All gross sweet foods such as:
  - Candy
  - Sugar
  - Jellies
  - Jams
  - Preserves, etc.

Cheese: All highly fermented

Nuts: All kinds

Soups:

- Meat soups or broths
- Vegetable stock from the gas-forming vegetables

Beverages:

- Carbonated water
- Highly sweetened drinks
- Coffee

Condiments and other foods:

- All condiments other than salt
- Excessively salted foods
- Spices
- Uncooked foods
- Fried or greasy food, especially cold.

Bland Diet

55 Gm. Protein
2,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 195, Protein 60, Fat 110, Calories 2,010

Food		*Gram Weight*	*Household Measure*
Cereal (cooked)		140	⅔ cup
Bread		90	3 slices
Butter		40	4 squares
Salad Dressing with oil			
Milk		460	2¼ glasses
Cream, 20%		120	½ cup
Meat* (lean)		45	1 small serving (1½ oz.)
Bacon			
Egg		100	2
Vegetables, 3%	puréed	200	2 servings (1 cup)
Vegetables, 6%			
Vegetables, 15%			
Fruit juice, 10%		200	1 glass
Fruit, 20%		100	1 serving (½ cup, cooked)
Potato or substitute		100	1 serving
Sugar		10	2 teaspoons
Dessert		100	1 serving

* Chicken, fish or scraped beef.

Bland Diet

55 Gm. Protein
2,000 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Orange juice	½ glass	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Toast	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Sugar	1 teaspoon	5
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Cream soup:		
Milk	¼ cup	60
Cream, 20%	¼ cup	60
Vegetable purée	½ cup	100
Salt		
Egg or substitute	1	50
Bread	1 slice	30
Butter	1 square	10
Cooked fruit	1 serving	100
Milk	1 glass	200
DINNER		
Fruit juice	½ glass	100
Meat*	1 small serving	45
Boiled rice	½ cup	100
Vegetable purée	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Dessert (simple)	1 serving	100
Milk	1 glass	200

* Chicken, fish or scraped beef.

CHRONIC GASTRITIS

A quarter of a century ago, Konjetzny published his conclusions that there was a high incidence of chronic gastritis, especially the atrophic form, in association with gastric carcinoma, and that the former was the precursor of the latter. Hurst, for clinical reasons, shared the same viewpoint. That carcinoma does not develop in a healthy subject has been acknowledged for years. It is apparent that ulcers, polyps, adenomas and chronic gastritic changes may be the precursor of carcinoma. In the light of modern developments, especially the information obtained from histologic study of freshly sectioned gastric tissues and from gastroscopic examinations, it is reasonable to assume that advance in our knowledge of the pathology of the living has been retarded somewhat by the conclusions drawn from postmortem examinations. It is just as reasonable to conceive of a gastritis as it is of a glossitis, a cystitis or a proctitis.

Accumulative experience in the past few years has forced upon us the conviction that the attitude of our colleagues on the European continent in the past fifteen years with regard to gastritis is somewhat justifiable. The problem of gastritis and its relationship to other forms of gastric diseases has been a source of considerable interest and speculation. Due to the pioneer work of Beaumont, Konjetzny, Schindler and others, sufficient evidence has been accumulated from the gastroscopic observations, verified by surgical and pathologic examinations, to establish gastritis as a definite clinical problem. We now know that many patients who in the past were regarded as having functional dyspepsia or psychoneurosis were suffering from gastritis. Gastroscopic examination is indicated for every patient who has a consistent chronic gastric complaint if roentgenologic examination fails to disclose a gross lesion, or if any obvious cholecystic, appendiceal or pancreatic disease, psychoneurosis or an allergic state is absent. Recent articles on symptomatology by Schindler, Swalm, Benedict and others state that the symptoms of chronic superficial and especially chronic hypertrophic gastritis, as seen through the gastroscope, may simulate those of chronic gastric or duodenal ulcer to a considerable extent. The presence of nervousness apparently does not exclude chronic gastritis, as nervousness is a symptom in some of the cases of chronic atrophic gastritis.

Many writers feel that chronic gastritis or so-called catarrhal gastritis is rare—and perhaps it is. There may be, however, a chronic irritation of the gastric mucosa from various causes which are more or less unrecognized as a possible factor responsible for some of the indefinite symptomatology without roentgenologic evidence of pathology.

Ordinarily chronic gastritis, if not controlled, leads to a gradual atrophy of the glandular tissue of the gastric mucosa, and a diminished or absent hydrochloric-acid secretion results. In a few cases there is an associated hyperacidity.

In either case the diet selected for chronic gastritis will depend upon whether or not the patient has an associated hyperacidity or hypo-acidity. In cases of chronic gastritis with hypo-acidity we suggest choosing a diet from the group of diets presented on pages 472 to 479 for hypo-acidity. In chronic gastritis with hyperacidity we suggest selecting a diet from the group presented on pages 462 to 469 for hyperacidity. In each case particular attention is called to the list of typical foods to be emphasized and those to be avoided for hypo-acidity, pages 470 and 471, and for hyperacidity, page 712.

GASTRIC NEUROSIS

As a rule, the nervous dyspepsia from a gastric standpoint forms only one phase of an associated psychoneurosis. The most important thing to do when this condition is suggested is to rule out any possibility of organic diseases and be sure of the diagnosis. There may be many dietary phobias and misconceptions to be combated. Patients may attempt to treat themselves by eliminating from the diet one foodstuff after another in the hope of finding the food which precipitates their distress. They may be very undernourished by this procedure. Any overemphasis of special-diet procedure in gastric neurosis is definitely a mistake. The main thing to be done is to encourage the patient to eat. His chief help will come from rest and psychotherapy.

Diseases of Esophagus and Stomach

(*Continued*)

HYPERCHLORHYDRIA

Nature of Condition

Stimulated gastric secretion with or without associated disease

Object of Diet

To give bland and nonstimulating foods

Hyperchlorhydria is not a disease but a clinical syndrome in which both gastric hyperacidity and epigastric distress are present. Hyperchlorhydria accompanies a large number of conditions both organic and functional.

Important Factors in Dietary Treatment of Hyperchlorhydria

1. Foods: Those that are moderately bland and that combine with acids
2. Stimulants: Those of a weak secretory and peristaltic nature
3. Fat: Moderately high
4. Fruits and fruit juices: Subacid
5. Meal periods: Regular and in some cases frequent

The typical foods to use and those to avoid in the treatment of hyperchlorhydria are the same as those used in the bland diet, page 712. All fried and greasy foods, bulky and fibrous vegetables and fruits, concentrated sugars, alcohol, spices and condiments, which are irritating, should be avoided. Many patients feel better by omitting tea and coffee. In patients with a constantly recurring hyperacidity we suggest Diet 3 used in the treatment of peptic ulcer, pages 312 and 313. It may even be necessary to start with Diets 1 or 2, pages 308 to 311, until the acidity is controlled, and then increase to Diet 3, to be followed for an indefinite period of time.

Directions for Application of Diets

The diet for hyperchlorhydria should be the one best suited to the basic disease. If only a hyperacidity is present without complications, one of the four diets outlined for hyperacidity may be used.

Symptoms Associated with Hyperchlorhydria

Heartburn. Heartburn and eructation of acid fluid often occur in many cases of dyspepsia and sometimes there is vomiting, the vomit being so acid as to burn throat and mouth.

Clinicians differ in opinion as to the physiology of this symptom. Some have believed heartburn to be due to the regurgitation of acid gastric juice into the lower part of the esophagus, which is a result of the excess hydrochloric acid in the stomach. Hurst, however, has shown that 0.5 per cent of hydrochloric acid may be put into the stomach without producing any sensation in either the stomach or the esophagus. Also, it is known that the gastric analysis may show an apparently normal acidity; or even with anacidity of the stomach the patient may suffer from the symptoms of hyperchlorhydria and the condition is usually relieved by alkalis.

Hurst is of opinion that two mechanisms are necessary to explain this fact: first, that during an attack of indigestion, alcohol and organic acid are liberated and produce a burning sensation in esophagus and stomach; second, that the increased tension of the muscular coats of the lower esophagus is responsible. This tension is produced by the excess of hydrochloric acid in the stomach, therefore the symptom is relieved by alkalis.

Some believe that alkalis not only neutralize the acid but open the pylorus, thus relieving the tension of the stomach.

It is believed by others that heartburn is a result of tonic contractions of the esophagus. Still others are of opinion that the acid gastric juice irritates the cardiac end of the esophagus. The irritation may be caused by acid chyme, as in duodenal ulcer, or by a very sensitive mucous membrane of the esophagus. It may be a combination of the last two factors.

Acid regurgitation is a symptom of hyperchlorhydria. It usually occurs soon after a meal, during the early stages of digestion, when the lower part of the esophagus is not firmly contracted. The regurgitation is accompanied by a burning sensation in throat and esophagus.

Water brash is the sudden filling of the mouth with alkaline saliva. This is believed by some to be characteristic and a valuable aid in the diagnosis of duodenal ulcer.

60 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 125, Protein 60, Fat 75, Calories 1,415

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	60	3 thin slices
Butter	20	2 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	75	1 serving (2½ oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Orange juice	120	½ cup (8 tablespoons)
Fruit, 15%, 20%	300	3 servings
Vegetables, 20%		

60 Gm. Protein
1,400 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Cooked fruit, 15% or 20%	1 serving	100
Bread (toast)	1 thin slice	20
Butter	½ square	5
Bacon (two or three times a week)	2 slices, crisp	10
Egg	1	50
Cream, 20%	¼ cup	60
Orange juice	4 tablespoons	60
Beverage—coffee substitute		
LUNCHEON		
Egg or substitute	1	50
Vegetable, 3%	1 serving	100
Bread	1 thin slice	20
Butter	½ square	5
Fruit, 15% or 20%	1 serving	100
Milk	1 glass	200
Orange juice	2 tablespoons	30
DINNER		
Meat	1 serving	75
Vegetables, 3 or 6%	2 servings	200
Bread	1 thin slice	20
Butter	1 square	10
Fruit, 15% or 20%	1 serving	100
Milk	1 glass	200
Orange juice	2 tablespoons	30

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 155, Protein 60, Fat 105, Calories 1,805

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	60	3 thin slices
Butter	60	6 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit juice, 10%	120	½ cup (8 tablespoons)
Fruit, 15–20%	300	3 servings
Potato	75	1 small serving
Sugar	5	1 teaspoon

60 Gm. Protein
1,800 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit, cooked, 15% or 20%	1 serving	100
Cereal (cooked)	½ cup	105
Bacon (two or three times a week)	2 slices, crisp	10
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	2 squares	20
Sugar	1 teaspoon	5
Cream, 20%	¼ cup	60
Orange juice	4 tablespoons	60
Beverage—coffee substitute		
LUNCHEON		
Egg or substitute	1	50
Vegetable	1 serving	100
Bread	1 thin slice	20
Butter	2 squares	20
Fruit, 15% or 20%	1 serving	100
Milk	1 glass	200
Orange juice	2 tablespoons	30
DINNER		
Meat	1 serving	60
Potato	1 small serving	75
Vegetables	2 servings	200
Bread	1 thin slice	20
Butter	2 squares	20
Fruit, 15% or 20%	1 serving	100
Milk	1 glass	200
Orange juice	2 tablespoons	30

65 Gm. Protein
2,200 Calories

Quantitative and Estimated Quantitative Total Food Allowance for One Day

Carbohydrate 200, Protein 65, Fat 125, Calories 2,200

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	55	5½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	120	½ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15%	300	3 servings
Fruit juice, 10%	120	½ cup (8 tablespoons)
Fruit, 15–20%	200	2 servings
Potato	75	1 small serving
Dessert	100	1 serving
Sugar	10	2 teaspoons

65 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Cooked fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices, crisp	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	1½ squares	15
Cream, 20%	½ cup	120
Sugar	2 teaspoons	10
Orange juice	4 tablespoons	60
Beverage—coffee substitute		
LUNCHEON		
Egg or substitute	1	50
Vegetable	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
Orange juice	2 tablespoons	30
DINNER		
Meat	1 serving	60
Vegetables	2 servings	200
Potato	1 small serving	75
Bread	1 slice	30
Butter	2 squares	20
Dessert	1 serving	100
Milk	1 glass	200
Orange juice	2 tablespoons	30

65 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 215, Protein 65, Fat 165, Calories 2,600

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	100	10 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	120	½ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10% juice	120	½ cup
Fruit, 15–20%	200	2 servings
Potato or substitute	150	2 small servings
Sugar	10	2 teaspoons
Dessert	100	1 serving

65 Gm. Protein
2,600 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Cooked fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices, crisp	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Sugar	2 teaspoons	10
Cream, 20%	½ cup	120
Orange juice	4 tablespoons	60
Beverage—coffee substitute		
LUNCHEON		
Egg or substitute	1	50
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Bread	1 slice	30
Butter	4 squares	40
Fruit	1 serving	100
Milk	1 glass	200
Orange juice	2 tablespoons	30
DINNER		
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetables	2 servings	200
Bread	1 slice	30
Butter	4 squares	20
Dessert	1 serving	100
Milk	1 glass	200
Orange juice	2 tablespoons	30

Diseases of Esophagus and Stomach

(Continued)

ACHLORHYDRIA AND ACHYLIA GASTRICA

Nature of Condition

Depressed secretion with or without associated disease

Object of Diet

To give strong secretory stimulants and natural acid foods

Achlorhydria is a condition of depressed gastric secretion in which no free hydrochloric acid is detected in the stomach, although acid and some degree of enzyme activity are present. Achylia gastrica is a condition in which neither free nor combined hydrochloric acid is present and there is an absence of gastric enzymes. There is even no response to histamine.

Conditions of depressed gastric secretion may be found in healthy people who have perfectly normal digestion. Thus it may be inherited or acquired. Achlorhydria is always found in pernicious anemia and may also be found in such conditions as carcinoma, diabetes, nephritis, cholecystitis, myxedema, chronic gastritis, scurvy, pellagra and sprue, and in patients with a low metabolism but not a true myxedema.

Diarrhea is an occasional accompaniment of achylia. Often the use of dilute hydrochloric acid will be all that is necessary to control this symptom.

IMPORTANT FACTORS IN DIETARY TREATMENT OF HYPO-ACIDITY

1. Stimulants: Strong secretory
2. Foods: Low residue and natural acid
3. Fats and proteins: The excessive use to be avoided
4. Fermentable sugars and sweets: To be avoided
5. Mastication: Thorough
6. Extremes of hot and cold foods: To be avoided

In conditions with depressed gastric secretion it may be a wise plan to avoid the excessive use of fats. It is known that fats leave the stomach slowly and also tend to depress the secretion of hydrochloric acid. However, the knowledge of fat metabolism is still very immature and the individual's reaction to fat must govern its use.

DIRECTIONS FOR APPLICATION OF DIET

The diet for achlorhydria and achylia should be the one best suited to the basic disease. If only an acquired or inherited achylia is present and the only concern is the anacidity or hypo-acidity, the bland diets suggested may be followed, particular attention being paid to the typical foods that are allowed and those that are to be avoided.

Typical Foods to Emphasize in the Treatment of Achlorhydria and Achylia Gastrica

Foods that are most stimulating to gastric secretion:

Clear meat or vegetable broths

Fruit juices, especially the citrous fruits

Foods that are easily digested:

- **Cereals,** cooked and dry
- **Bread,** plain or toasted (not fresh breads)
- **Milk**
- **Egg:**
  - Soft-cooked
  - Poached
  - Souffléed
  - In baked omelet
- **Cheese:**
  - Cottage cheese
- **Meat—lean:**
  - Chicken
  - Fish
  - Liver
  - Lamb
  - Beef—very tender or scraped beef
  - Sweetbreads
  - Oyster
- **Potato:**
  - Boiled
  - Creamed
  - Scalloped
  - Mashed
  - Baked
- **Vegetables**—no skin or seeds:
  - Carrot
  - Squash
  - Beet
  - Pea
  - Spinach
  - String bean
  - Asparagus
  - Cauliflower
  - Tomato
- **Fruits**—cooked,* no skins or seeds:
  - Apple
  - Prune
  - Peach
  - Pear
  - Apricot
  - White cherry
  - Banana, ripe
  - Fruit juices of all kinds
- **Desserts:**
  - Ices, jello, cooked fruits
  - Simple puddings, as in bland diet
  - Cake
    - Angel food
    - Hard sugar cookies
- **Beverages:**
  - Coffee
  - Tea
  - Coffee substitute
- **Condiments:**
  - Salt

Typical Foods to Avoid in the Treatment of Achlorhydria and Achylia Gastrica

- Excessive fats and protein, especially the fried greasy foods:
  - Pork
  - Veal
  - Sardines
- Highly fermentable sugars and sweets
- Starches, such as pastry, pie, rich cake
- Cheese (except cottage cheese)
- Nuts
- Raw and coarse vegetables
- Foods that contain sodium bicarbonate
- Beverages that contain carbonated water
- Condiments:
  - Mustard
  - Pepper
  - Horse-radish
  - Highly seasoned sauces

ACCESSORY FACTORS IN TREATING ACHLORHYDRIA

Frequently in the management of a patient with achlorhydria it is desirable to give dilute hydrochloric acid before or with meals. This should be taken either through a glass tube to avoid contact with the teeth or in the form of gelatin capsules.

If the physician finds no contraindication, from ½ to 1 ounce of spirits may be prescribed for elderly patients once or twice a day about fifteen minutes before the meal. The administration of this amount of liquor will tend to stimulate the hydrochloric acid of the stomach. It must be remembered of course that in alcoholics, as a rule, the long-continued use of liquor as a beverage diminishes the natural flow of gastric hydrochloric acid.

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* Fruits may be cooked or canned with a small amount of sugar.

60 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 110, Protein 60, Fat 80, Calories 1,400

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	60	3 thin slices
Butter	25	2½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	75	1 serving (2½ oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, juice	100	½ glass
Fruit, 10%		
Fruit, 15–20%	200	2 servings
Vegetable or meat consommé	300	2 servings

60 Gm. Protein
1,400 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit juice	½ glass	100
Bacon	2 slices, crisp	10
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	½ square	5
Cream, 20%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Clear broth or consommé	1 serving	150
Egg or substitute	1	50
Vegetables	1 serving	100
Bread	1 thin slice	20
Butter	1 square	10
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Clear broth or consommé	1 serving	150
Meat	1 serving	75
Vegetables	2 servings	200
Bread	1 thin slice	20
Butter	1 square	10
Fruit	1 serving	100
Milk	1 glass	200

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 145, Protein 60, Fat 110, Calories 1,810

Food	*Gram Weight*	*Household Measure*
Cereal	105	½ cup
Bread	60	3 thin slices
Butter	65	6½ squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, orange juice	100	½ glass
Fruit, 15–20%	200	2 servings
Potato or substitute	100	1 serving
Sugar	5	1 teaspoon
Vegetable or meat consommé	300	2 servings

60 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Orange juice	½ glass	100
Cereal	½ cup	105
Bacon	2 slices, crisp	10
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 teaspoon	5
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Consommé	1 serving	150
Egg or substitute	1	50
Vegetables	2 servings	200
Bread	1 thin slice	20
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Consommé	1 serving	150
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetables	1 serving	100
Bread	1 thin slice	20
Butter	2½ squares	25
Fruit	1 serving	100
Milk	1 glass	200

65 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 215, Protein 65, Fat 120, Calories 2,200

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	50	5 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	120	½ glass
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegtables, 3% Vegtables, 6% Vegtables, 15%	300	3 servings
Fruit, 10%, juice	200	1 glass
Fruit, 15–20%	200	2 servings
Potato or substitute	100	1 serving
Sugar		2 teaspoons
Dessert	100	1 serving
Vegetable or meat consommé	300	2 servings

65 Gm. Protein
2,200 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit juice	½ glass	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices, crisp	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	1 square	10
Cream, 20%	½ cup	120
Sugar	2 teaspoons	10
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Consommé	1 serving	150
Egg or substitute	1	50
Vegetables	2 servings	200
Bread	1 slice	30
Butter	2 squares	20
Fruit juice	½ glass	100
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Consommé	1 serving	150
Meat	1 serving	60
Potato	1 serving	100
Vegetable	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Dessert	1 serving	100
Milk	1 glass	200

65 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 270, Protein 65, Fat 140, Calories 2,600

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	70	7 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	120	½ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, juice	600	3 glasses
Fruit, 15–20%	200	2 servings
Potato or substitute	150	2 small servings
Sugar or jelly	15	1 tablespoon
Dessert	100	1 serving
Vegetable or meat consommé	300	2 servings

65 Gm. Protein
2,600 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit juice	1 glass	200
Cereal (cooked)	⅔ cup	140
Bacon	2 slices, crisp	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Cream, 20%	½ cup	120
Sugar or jelly	1 tablespoon	15
Beverage—coffee, tea or coffee substitute		
A.M. 10:00 Fruit juice	1 glass	200
LUNCHEON		
Consommé	1 serving	150
Egg or substitute	1	50
Potato or substitute	1 small serving	75
Vegetable	1 serving	100
Bread	1 slice	30
Butter	2½ squares	25
Fruit	1 serving	100
Milk	1 glass	200
P.M. 3:00 Fruit juice	1 glass	200
DINNER		
Consommé	1 serving	150
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable	2 servings	200
Bread	1 slice	30
Butter	2½ squares	25
Fruit	1 serving	100
Dessert	1 serving	100
Milk	1 glass	200

Diseases of Esophagus and Stomach

(Continued)

OBSTRUCTIVE LESIONS OF THE ESOPHAGUS

Nature of Condition

Variety of conditions interfering with passage of food

Object of Diet

To meet patient's needs with sufficient nourishment to prevent emaciation

Obstructive lesions of the esophagus may result from a variety of conditions. There may be extrinsic factors, such as aneurysm or mediastinal growths; or there may be intrinsic lesions, such as carcinoma, cicatricial contractions, cardiospasm and diverticula. The degree and the nature of the obstructive lesion present determine the type of treatment —dilatation, radiation or surgical interference. Irrespective of the treatment necessary, the diet principles are essentially the same, any slight variation in foods depending on the degree or the type of obstruction.

Important Factors in Dietary Treatment of Obstructive Lesions of the Esophagus

1. Residue: Very low
2. Foods: Concentrated, highly nourishing and easily assimilated
3. Feedings: In small amounts at frequent intervals

Liquids and semiliquids should be given patients with obstructive lesions, as well as food that is concentrated and highly nourishing. Milk, cream and eggs are the usual foods, with such additions as puréed vegetables, custards, milk toast, cereals and the like, all of which are easily assimilated. The best method of feeding is usually small amounts of food at frequent intervals. Some patients, especially those with cardiospasm, tolerate solid food better than liquids.

Directions for Application of Diets

Two diets for obstructive lesions of the esophagus are given: one, a liquid diet, contains 2,200 calories; the other, a semisolid diet, contains 2,200 calories. The quantity of each food allowed may be increased or decreased, depending upon the patient's need and the nature of the obstruction.

Liquid Diet

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 250, Protein 60, Fat 105, Calories 2,185

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread		
Butter		
Salad dressing with oil		
Milk	1,000	5 glasses (1 quart)
Cream, 20%	240	1 cup
Meat (lean)		
Bacon		
Egg	150	3
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	200	2 servings (1 cup)
Fruit, 10%, juice	600	3 glasses
Vegetables, fruit, 15–20%		
Sugar or lactose	105	7 tablespoons

Liquid Diet

60 Gm. Protein
2,200 Calories

Suggested Distribution of Total Food Allowance for One Day

				Gm.
		BREAKFAST		
A.M.	8:00	Fruit juice	1 glass	200
		Cereal gruel:		
		Cereal (cooked, strained)	½ cup	105
		Cream, 20%	½ cup	120
		Salt		
		Sugar or lactose	2 tablespoons	30
	10:00	Eggnogg*	1 large glass	250
		DINNER		
M.	12:00	Fruit juice	1 glass	200
		Sugar or lactose	1 tablespoon	15
		Cream soup:		
		Puréed vegetable	½ cup	100
		Milk	About ½ cup	100
		Cream, 20%	¼ cup	60
		Salt		
P.M.	2:00	Eggnogg*	1 large glass	250
	4:00	Milk	1 glass	200
		SUPPER		
	6:00	Fruit juice	1 glass	200
		Sugar or lactose	1 tablespoon	15
		Cream soup:		
		Puréed vegetable	½ cup	100
		Milk	About ½ cup	100
		Cream, 20%	¼ cup	60
		Salt		
	8:00	Eggnog*	1 large glass	250

* Eggnog:

Egg	1
Milk	1 glass
Sugar	1 tablespoon
Vanilla	To taste

Semisolid Diet

65 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 230, Protein 65, Fat 115, Calories 2,215

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	60	3 thin slices
Butter	40	4 squares
Salad dressing with oil		
Milk	800	4 glasses
Cream, 20%	200	1 glass
Meat (lean)		
Bacon		
Egg	150	3
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	200	2 servings (1 cup)
Fruit, 10%, juice	200	1 glass
Fruit, 15%, puréed	100	1 serving
Potato or substitute	150	2 small servings
Sugar or lactose	30	2 tablespoons
Dessert, simple	100	1 serving

Semisolid Diet

65 Gm. Protein
2,200 Calories

Suggested Distribution of Total Food Allowance for One Day

	BREAKFAST		*Gm.*
A.M. 8:00	Fruit juice	½ glass	100
	Cereal (cooked, strained)	½ cup	105
	Egg, soft-cooked	1	50
	Toast	1 thin slice	20
	Butter	1 square	10
	Cream, 20%	½ glass	100
	Sugar	1 tablespoon	15
	Beverage—coffee, tea or coffee substitute		
10:00	Milk	1 glass	200
	LUNCHEON		
M. 12:00	Cream soup:		
	Puréed vegetable	½ cup	100
	Cream, 20%	½ glass	100
	Salt		
	Potato	1 small serving	75
	Toast	1 thin slice	20
	Butter	1½ squares	15
	Simple pudding or ice cream	1 serving	100
	Milk	1 glass	200
P.M. 3:00	Eggnog:		
	Milk	1 glass	200
	Egg	1	50
	Sugar or lactose	1 tablespoon	15
	Vanilla		
	DINNER		
6:00	Egg or egg substitute	1	50
	Rice potato or finely cooked cereal	1 small serving	75
	Puréed vegetable	½ cup	100
	Toast	1 thin slice	20
	Butter	1½ squares	15
	Puréed fruit	1 serving	100
	Milk	1 glass	200
8:00	Fruit juice	½ glass	100

Diseases of Esophagus and Stomach

(*Continued*)

OBSTRUCTIVE LESIONS OF THE STOMACH

Nature of Condition

Any interference with passage of food

Object of Diet

To meet patient's needs with minimum residue

The most common causes of obstructive lesions of the stomach are ulcer and carcinoma. Occasionally obstruction is due to benign cirrhosis, but this is a rare entity. As soon as a diagnosis is made of an obstructive lesion due either to ulcer or to carcinoma, surgery is indicated. It may be necessary in certain conditions to delay surgery. In other conditions the lesion may be in such an advanced stage of malignancy that surgery would be of no value. The outlook for patients with an obstructive ulcer is very favorable; for those with an obstructive carcinoma, grave.

Important Factors in Dietary Treatment of Obstructive Lesions of the Stomach

1. Residue: Minimum
2. Foods: Concentrated, highly nourishing and easily assimilated, avoiding those that are mechanically and chemically irritating
3. Feedings: In small amounts at frequent intervals

The diet should be composed largely of milk, preferably boiled milk, eggs, cream soups, with such additions as puréed vegetables, custards, rennet custard, milk toast, fine cereals and the like that are readily assimilated, depending upon the degree of obstruction. Lavage of the stomach before breakfast and, if necessary, before bedtime will aid appetite and digestion, as well as conduce to the patient's comfort, when the obstructive lesions are severe enough to cause stagnation and fermentation.

When vomiting is present, lavage of the stomach combined with rest from any feeding for from six to twelve hours will often relieve it.

Directions for Application of Diets

Two diets for use in obstructive lesions of the stomach are presented on pages 488 to 491: one contains 1,775 calories; the other, 2,000 calories. If the nature of the obstruction will allow of a larger intake of food, the quantity at each feeding may be increased.

The typical foods allowed and those to be avoided in the treatment of obstructive lesions of the stomach are the same as those suggested for the treatment of peptic ulcer, page 301. Any of these foods that cannot be reduced to a liquid or semiliquid state should be avoided.

Liquid Diet

50 Gm. Protein
1,775 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD INTAKE FOR ONE DAY

Carbohydrate 180, Protein 50, Fat 95, Calories 1,775

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Butter	5	½ square
Salad dressing with oil		
Milk	800	4 glasses
Cream, 20%	200	1 cup
Meat (lean)		
Bacon		
Egg	150	3
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	100	½ cup
Fruit, 10%, juice	50	¼ glass
Vegetables, fruit, 15–20%		
Sugar or lactose	120	8 tablespoons

Liquid Diet

50 Gm. Protein
1,775 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD INTAKE FOR ONE DAY

				Gm.
		BREAKFAST		
A.M.	8:00	Egg broth:		
		Egg	1	50
		Milk	½ glass	100
		Butter	½ square	5
		Salt		
		Orange juice	¼ glass	50
		Sugar or lactose	2 tablespoons	30
	10:00	Milk	¾ glass	150
		Lactose	1 tablespoon	15
		DINNER		
M.	12:00	Cream soup:		
		Puréed vegetable	¼ cup	50
		Cream, 20%	About ½ cup	100
		Salt		
P.M.	2:00	Milk	¾ glass	150
		Lactose	1 tablespoon	15
	4:00	Eggnog:		
		Milk	½ glass	100
		Egg	1	50
		Sugar or lactose	2 tablespoons	30
		SUPPER		
	6:00	Cream soup:		
		Puréed vegetable	¼ cup	50
		Cream, 20%	About ½ cup	100
		Salt		
	8:00	Eggnog:		
		Milk	½ glass	100
		Egg	1	50
		Sugar or lactose	2 tablespoons	30
		Vanilla		

Liquid Diet

55 Gm. Protein
2,000 Calories

Quantitative and Estimated Quantitative Total Food Allowance for One Day

Carbohydrate 200, Protein 55, Fat 110, Calories 2,010

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread		
Butter		
Salad dressing with oil		
Milk	800	4 glasses
Cream, 20%	300	1½ glasses
Meat (lean)		
Bacon		
Egg	150	3
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	100	½ cup
Fruit, 10%, juice	200	1 glass
Vegetables, fruit, 15–20%		
Sugar or lactose	105	7 tablespoons

Liquid Diet

55 Gm. Protein
2,000 Calories

Suggested Distribution of Total Food Allowance for One Day

			Gm.
	BREAKFAST		
A.M. 8:00	Cereal gruel:		
	Cereal (cooked, strained)	½ cup	105
	Cream, 20%	About ½ cup	100
	Salt		
	Orange juice	¼ glass	50
	Sugar or lactose	1 tablespoon	15
10:00	Eggnog:		
	Milk	1 glass	200
	Egg	1	50
	Sugar or lactose	1 tablespoon	15
	Vanilla		
	DINNER		
M. 12:00	Cream soup:		
	Puréed vegetable	¼ cup	50
	Cream, 20%	About ½ cup	100
	Salt		
	Orange juice	¼ glass	50
	Sugar or lactose	1 tablespoon	15
P.M. 2:00	Eggnog:		
	Egg	1	50
	Milk	1 glass	200
	Sugar or lactose	2 tablespoons	30
	Vanilla		
	Orange juice	¼ glass	50
4:00	Milk	1 glass	200
	SUPPER		
6:00	Cream soup:		
	Puréed vegetable	¼ cup	50
	Cream, 20%	About ½ cup	100
	Salt		
8:00	Eggnog:		
	Egg	1	50
	Milk	1 glass	200
	Sugar or lactose	2 tablespoons	30
	Vanilla		
	Orange juice	¼ glass	50

Diseases of the Liver

Nature of Disease

Any condition of the liver interfering with one or more of the important digestive functions

Object of Diet

To give foods that repair and protect injured cells and are readily assimilated with a minimum of digestive difficulty

The liver manifests as many types of pathology as any organ in the body. Some of these pathologic processes are congenital anomalies, vascular affections, hepatic infiltrations and degenerations, jaundice, inflammatory lesions, acute yellow atrophy, cirrhosis and benign and malignant growths.

Within recent years a great deal of valuable experimental work has been done on the pathologic physiology of the liver. This has indicated the tremendous reserve function of the organ and its capacity for regeneration and repair. On both clinical and experimental grounds it may be said that the general problem of protecting the parenchyma of the liver is somewhat the same in treatment of all types of liver injury.

Simple atrophy, fatty metamorphosis and focal necrosis apparently represent the fundamental measures associated with all types of hepatic injury, in that the destruction, the subsequent repair and the regeneration of the liver proceed in about the same manner, although not necessarily at the same rate.

Because the liver plays such an extremely important part in the digestion and the metabolism of food nutrients, reference should be made briefly to its various functions.

IMPORTANT FUNCTIONS OF THE LIVER

The Liver Secretes Bile. The chief manifestation of the liver's secretory activity is the formation and the excretion of bile. This is a complex function, since in the process the liver excretes not only the pigment bilirubin but other components of the bile, such as cholesterol, and also manufactures the bile acids. Bile salts are manufactured solely by the liver cells and they play an important role in the digestion of fats. They may also exert an antiseptic action or exhibit bacterial growth in the intestine.

Metabolism of the Body. There are few phases of bodily nutrition in which the liver does not play some part.

Formation, Storage and Hydrolysis of Glycogen. The liver stores carbohydrates in the form of glycogen and also supplies glucose when that sugar is needed by converting its glycogen reserve to glucose. The liver can manufacture glucose from various noncarbohydrates, such as protein and the glycerol portion of the fat. The entire activity of the liver in the realm of carbohydrate metabolism is designed to maintain a normal blood-sugar level.

The relationship of the liver to protein metabolism is important but only partially understood. The liver stores a goodly amount of protein. It also probably manufactures much of the proteins of the blood serum, notably the albumin, as well as the fibrinogen and the prothrombin. The liver assists in protein metabolism by deaminizing amino acids not needed for the repair of body tissue. Nitrogen is removed in the form of ammonia, which is then changed to urea and eliminated. The role of the liver in uric-acid formation in man is not yet clearly defined.

Storage and Activation of Fat. The liver stores amounts of fat which vary with the nutritional status of the individual and with the influence of certain toxic and infectious agents. Fat may be formed in the liver from other food substances. If not needed for energy, it is stored in the body. It also has the power of preparing the fats for utilization by the tissues. The liver also desaturates fatty acids and manufactures ketone bodies.

The liver acts as a storage organ for water and as a reservoir for blood, and therefore serves an important function in the regulation of blood volume.

Formation or Storage of Vitamins. The liver manufactures vitamin A from carotene and stores vitamin A. It also stores the vitamin B complex, but there is yet no clear understanding of the effect of the components of the vitamin B complex on fat deposit in the liver. It is possible that some of the vitamin B factors are antagonistic to the lipotropic effect of choline, but further study is needed to settle this. These functions in all probability must be disturbed considerably by injury to the parenchyma. If bile is diverted from the intestinal tract by an external fistula or by mechanical obstruction of the common duct, the absorption of vitamins also is affected adversely. Greaves and Schmidt have shown that in the presence of experimental biliary fistula, vitamins B and E, as well as certain substances necessary for coagulation of the blood, are not absorbed. Heymann has demonstrated the failure to absorb vitamin D in the presence of biliary obstruction. Difficulties in the absorption, the storage and the utilization of vitamins thus may be an element of great importance in the progression of liver disease. Eppinger has recognized these difficulties of absorption and has recommended that vitamins be administered only by injection in these circumstances. Possibly with large dosage and the judicious use of bile or bile salts, administration by injection may not be necessary, but in any case the addition of concentrates of vitamins to the diet seems essential. The liver is a great storage depot for vitamin K and converts vitamin K to prothrombin.

The role of the liver in the excretion of bilirubin has been listed in considering the formation of bile. Bile pigment appears to be an excretion except that it consumes the iron content of the body by resorption from the alimentary canal. The liver also reconverts to bilirubin some of the urobilinogen brought to it through the portal system. It is also active in the excretion and possibly in the metabolism of the porphyrins. Since it has been found that an increase in the urinary output of porphyrin is an early indication of hepatic dysfunction, it may be assumed that the liver normally excretes this pigment.

Detoxifying Function. This is an extremely important function of the liver. By virtue of its position, blood from the intestinal tract passes through this organ before entering the general circulation and the hepatic cells have the opportunity to remove various toxic substances before these reach the body as a whole. Detoxification may take place by various mechanisms.

Some of the chemical mechanisms are the conjugation of toxic substances with sulfuric acid to make sulfates or with amino acids as in the case of benzoic acid, which joins with glycine to form hippuric acid. In this way the toxic bodies are converted to substances which are harmless. The liver also oxidizes, reduces and acetylates various substances.

Certain heavy metals, such as mercury, are excreted in the bile, and numerous bacteria are excreted in the bile also, typhoid bacilli being a well-known example of this action.

Storage and possible destruction by the liver cells are considered to be a mode of protecting the body against various alkaloids, such as strychnine and morphine. These may be held in the liver and released to the body in small amounts so that their toxic effects are lessened by dilution.

The activity of the reticulo-endothelial cells of the liver, and also of other portions of the body, may remove dyes, bacteria and particulate substances from the blood.

The liver is one of the organs of red-blood-cell formation in the embryo. In later life the activity of the liver is an indirect one, the organ serving as a deposit for the storage of the antipernicious-anemia factor and also of iron and copper.

The liver is the site of formation of fibrinogen and prothrombin, two elements needed for normal blood coagulation. It also manufactures an anticoagulant substance, heparin.

IMPORTANT FACTORS IN DIETARY TREATMENT OF LIVER DISEASE

1. Carbohydrate: Large amount
2. Protein: High
3. Fats: Restricted as much as possible
4. Vitamins: In liberal amounts
5. Calories: Sufficient to maintain weight
6. Irritating food and condiments: To be avoided

Large Amount of Carbohydrate. A large amount of carbohydrate is always desirable when there is liver disease or impaired function. The fact that animals after the removal of the liver live much longer when given glucose demonstrates the distinct value of sugar. The bulk of the carbohydrate should be given as bland, nonirritating foods, such as cereals, rice, sirups, jellies, jams, candies and sweetened fruit juices, toast and mashed potato.

High Protein. Protein is not only protective but is essential for the repair of hepatic cells. The recommended amount of protein is from 110 to 135 Gm. daily. Approximately 50 per cent of the protein allowed is derived from meat. This is necessary because it is not practical to prepare a high protein diet of nonmeat foods. The best type of protein to use for patients with hepatic disease is that derived from milk, cottage cheese, egg white and fine cereals. Amino acids, as well as brewer's yeast, may be used advantageously.

Fats Restricted as Much as Possible. Fats are to be restricted as much as possible, although some are necessary to give adequate calories and to prevent the diet from being too bulky. The fat allowance varies from 75 to 85 Gm. daily, except in the case of jaundice, when the fat is kept to a minimum. Diets containing fat as low as 30 Gm. per day are often termed fat-free diets. We prefer to call them low fat diets. It is difficult to plan a palatable diet that is absolutely fat-free. The only fats allowed in our diets for diseases of the liver are those contained in skimmed milk, one egg, one small serving of meat and the very small amount present in cereal and in bread. All fat is eliminated in preparing the food. The best fats to choose from are the emusified fats, butter, egg yolk and cream.

Use of Liberal Amounts of Vitamins. In addition to the use of from 25 to 50 Gm. of brewer's yeast daily, the diet should be supplemented with vitamins A, C, D, thiamine chloride, nicotinamide and riboflavin in amounts at least twice the recommended daily allowances. Choline should be given in doses of 2 Gm. daily.

Calories Sufficient to Maintain Weight. The diet should provide calories to maintain weight. Patients with liver disease should be cautioned not to overeat.

Avoidance of Irritating Foods and Condiments. All foods and condiments that irritate the liver must be avoided. Alcohol in all forms is damaging.

Disorders of the liver are responsible for many symptoms, but the popular idea of attributing to the liver any distress grossly termed biliousness or inactive liver when the well-being of the patient is disturbed is not justified. More often than not the distress so called is due to overindulgence in food or drink, to constipation or to some disease unrelated to the liver.

In spite of the many functions of the liver and the many difficulties encountered in all forms of therapy of liver disease, the value of high carbohydrate, high protein, low fat feeding in practically all conditions associated with toxic disturbances of the liver seems fairly well established. This is also true in jaundice, when fats usually are greatly restricted and the high carbohydrate, high protein diet is combined with mild laxatives. In cirrhosis of the liver with ascites the diet should be low in fluids and in salt. The Karell diet (p. 414) may be followed for a short period of time.

ADJUNCTS TO DIETARY TREATMENT

Glucose Therapy. Glucose therapy, although not spectacular, is extremely valuable. Suffice it to say that there is no apparent great advantage in giving glucose by vein if the patient can take adequate amounts of carbohydrates by mouth. However, in seriously ill patients there is often difficulty in the administration of an adequate high carbohydrate diet, and for this reason additional amounts of carbohydrate in the form of glucose must be administered intravenously. From one to three liters of a solution of 5 to 10 per cent glucose can and should be administered daily, and in some cases even larger amounts have been given by continuous venoclysis. Apparently the effect of the forced administration of a high intake of carbohydrate is that it reduces the content of fat of the diseased liver and favors the deposition of glycogen.

Sodium Chloride. If the chlorides of the plasma are low in concentration, it is a relatively simple matter to administer additional sodium chloride along with the glucose.

Amino Acids. The parenteral administration of amino acids forms a valuable supplement to treatment, even if the oral intake of food is satisfactory, since it is possible that proteins taken orally by patients with advanced cirrhosis may not be well digested or may be shunted away from the liver by the disturbed portal circulation. We have used with favorable results in cases of cirrhosis from 500 to 1,000 cc. slowly every day intravenously for from two to four weeks. The beneficial effect is probably due to the lipotropic action of the amino acids. Beneficial effects may also be obtained from the use of methionine in doses of from 1 to 5 Gm., or choline in doses of from 2 to 4 Gm. per day. Both have been shown to have lipotropic activity when given to animals and are apparently of benefit in treating cirrhosis in human beings.

Concentrates of Vitamins. The practice of feeding concentrates of vitamins, together with a diet high in carbohydrates and proteins, to patients who have cirrhosis of the liver, has been followed at the Mayo Clinic for some time, and strikingly good results have been noted in some cases. Patients who are able to eat a liberal diet invariably make better progress than those who have anorexia, and attempts at forced feeding with the use of concentrates of vitamins have much to recommend them on this basis alone.

Intramuscular Injections of Liver Extract. Intramuscular injections of liver extract may also have some direct effect on nitrogen balance and on the retention of protein. Alt has called attention to the fact that the use of liver extract will produce a positive nitrogen balance in pernicious anemia, and apparently it has somewhat the same effect in cases of hepatic disease, although probably on a much smaller scale.

Vitamin K and Bile Salts. The hemorrhagic diathesis associated with chronic hepatic disease and jaundice is dependent in part on deficient absorption of substances necessary for the coagulation of the blood and in part on depletion of the prothrombin of the blood because of hepatic injury. Clinical experience thus far, from the use of vitamin K supplemented with bile salts to facilitate its absorption from the intestine, seems to counteract this difficulty.

CIRRHOSIS OF THE LIVER

There is no conclusive evidence that hepatic cirrhosis in man is caused by dietary deficiency. However, experiments have so far proved that such deficiency causes cirrhosis in animals. The reason for including in this chapter on liver disease a special discussion on nutrition in cirrhosis of the liver is simply that, whether caused or not by dietary deficiency or defect—and it may be—cirrhosis of the liver if not too far advanced often responds to modern dietary therapy.

Chronic interstitial hepatitis (cirrhosis) is generally believed to be due to various toxic and infectious agents that cause destruction of the liver cells and ultimately lead to fibrosis of the liver. For many years alcohol has been considered one of the chief and commonest causes of cirrhosis of the liver. The incidence of the disease, however, does not parallel the amount of alcohol consumed in certain countries. Patch noted that while alcoholism was one of the most common antecedents of this disease in the western hemisphere, it was by no means a predisposing factor in all instances. However, both alcoholic and nonalcoholic cases of cirrhosis often had frank clinical evidence of vitamin B complex deficiencies. In certain groups that consume little if any alcohol, such as the Hindus, cirrhosis is nevertheless relatively frequent. Then again, as proved by autopsy, most drunkards do not have cirrhosis. According to Snell, only 5 per cent of chronic alcoholics show significant hepatic damage. It is quite evident then that alcohol alone cannot be considered responsible for cirrhosis of the liver. According to Connor, the nutritional errors of the alcoholic, who would rather drink than eat, are the basis of liver damage. On the other hand, it is doubtful whether any alcoholic on an adequate diet will develop cirrhosis.

It has already been stressed that primary nutritional errors may be the basis of the liver's susceptibility to the action of hepatotoxic agents. From a therapeutic point of view, it is equally important to realize that many of the symptoms manifested by a patient with cirrhosis of the liver are expressions of secondary nutritional deficiencies, which may develop during the course of the disease. The therapeutic objective is their correction.

NUTRITIONAL FACTORS IN OVERCOMING HEPATIC DYSFUNCTION

Glucose and the High Carbohydrate Diet. It is an undisputed clinical fact that either a high cabohydrate diet or intravenous glucose therapy protects and supports hepatic function. There is also ample experimental evidence to indicate that a variety of hepatotoxic agents—alcohol, arsenic, chloroform, morphine (in deep narcosis), etc.—deplete the liver of glycogen. With the depletion of glycogen there is an increase in the fat content of the liver. If the hepatic cells, on the other hand, have a high lipid content, the liver becomes more vulnerable to the action of hepatotoxic agents. It is also true that deposition of glycogen in the liver displaces fat and protects the liver against injury from hepatotoxic agents. However, it must be emphasized that for maximum protection of the liver carbohydrate alone is not sufficient; protein in the proper amount and of the proper kind must also be supplied. The high carbohydrate diet should provide from 350 to 450 Gm. of carbohydrates.

It has been known for some time that in hepatic disease the protein content of the blood is frequently diminished, and that there is a reversal of the albumin-globulin ratio. The greater the liver damage, the less able is the liver to synthesize serum albumin; hence the greater the alteration in serum protein. It is interesting to find that in syphilis or carcinoma of the liver, or passive congestion, these findings are not always obtained. The alteration of serum albumin is accompanied by a decrease in osmotic pressure. This phenomenon may play an important role in the production of ascites. Measures for elevating the albumin blood level in hepatic failure have long been sought by the clinician, but so far fruitlessly. High protein diets are usually ineffective. Blood-plasma transfusions may be of temporary benefit. However, the large quantities of plasma required may, in spite of plasma banks, not be readily obtainable. The use of amino-acid mixtures intravenously or subcutaneously may prove of considerable value as an adjunct to a high protein diet. In addition to the measures discussed, the management of ascites calls for restriction of fluids to from 1,500 to 2,000 cc. daily and a low salt intake. Paracentesis may be necessary to relieve symptoms due to abdominal distention. Ammonium chloride and mercurial directors diuretics are usually ineffective.

The importance of the quantity and the quality of protein in liver disease has only recently been realized. Ravdin and his associates, however, early furnished evidence of it; their work has since been confirmed and extended by Miller, Ross and Whipple. All these investigators have demonstrated that a high level of glycogen in the hepatic cell in the presence of a high fat and low protein content does not protect the liver against injury. On the other hand, they have shown that the addition of large amounts of the proper kind of protein will protect the liver against injury. Even in the presence of large amounts of fat, protein in proper kind and proper amount prevents the toxic action of chloroform on the liver. Protein is not only protective, but essential for the repair of hepatic cells and the formation of cholic and other bile acids. Protein deficiency in the diet impairs liver function.

The quality of protein is, as has been said, as important as the quantity. The lipotropic action of any protein apparently depends on the balance of its two sulfur-containing amino acids, methionine and cystine. Methionine, like choline, inhibits deposition of fat in the liver, whereas cystine increases it. Gyorgy and Goldblatt have also shown that the addition of 20 mg. of choline to the daily low protein diet of experimental animals reduces the incidence of cirrhosis among them by about a third. The addition of 100 mg. of 1-cystine increases the incidence and the severity of cirrhosis by a third. The toxic effect of cystine may be neutralized by the addition of choline. Recent developments which relate to the problem of lipotropic substances (methionine and choline) reveal that they possess one chemical group in common, the labile methyl group.

Choline. Although choline was chemically identified a century ago, its significance as a nutritional entity did not become apparent until 1932. At that time Best and Huntsman discovered it to be the active principle of raw pancreas and lecithin, which prevented the deposition of excess fat in the livers of depancreatized dogs.

Later it was determined that choline not only prevented the abnormal accumulation of fat, but that it had curative action and would alleviate the condition after it had become established. The term lipotropic was coined to designate compounds having similar action, several of which have been discovered. Some, such as betaine, are chemically related to choline and act directly upon fatty acids in the liver; others, such as methionine, act indirectly by supplying labile methyl groups which are required for the synthesis of choline. In addition, inositol lipocaic has been shown to affect certain kinds of fatty livers in animals.

The lipotropic effect of choline is believed to be due to its role in the formation of phospholipids from neutral fats deposited in the liver. After fat is absorbed from the intestinal tract, a large proportion reaches the liver for temporary storage. Here most, if not all, is transformed into phospholipids, in which form it may be transported by the blood stream for distribution in the body. This is accomplished by a union of phosphoric acid, fatty acids, and glycerol with choline.

Deficiency of choline in the presence of a high fat, low protein diet produces hepatic damage. However, the addition of choline to the diet prevents fatty changes in the liver. According to Griffith and Wade, the production of fatty liver is only one sign of a severe deficiency syndrome.

Hoagland found the administration of soybean lecithin to be the most economical and pleasant way of supplying choline to patients with cirrhosis of the liver. From 12 to 15 Gm. of soybean lecithin daily will provide the necessary amount of choline.

Anemia. It is by no means uncommon to find a marked macrocytic anemia developing during the course of hepatic cirrhosis. For this anemia, the administration of crude liver extract intramuscularly, 3 cc. every other day or twice weekly, has proved beneficial.

Vitamin Deficiency. There is experimental and postmortem evidence to indicate that the liver is a great storage depot of the fat-soluble vitamins A, D and K. The liver is also known to be instrumental in forming and storing the water-soluble vitamins B_1, B_2 and C.

Summary. There is some evidence to indicate that the pathologic changes occurring in cirrhosis of the liver may often be arrested if not reversed by modern nutritional therapy. The prognosis of cirrhosis of the liver, especially if treated in the earlier stages, is no longer hopeless. The therapeutic regimen includes the daily intake of from 2,500 to 3,000 calories or more. Of this amount, protein constitutes from 110 to 135 Gm., carbohydrate from 350 to 500 Gm., and fat from 70 to 100 Gm. The diet is supplemented by vitamins A, C and D and members of the B complex and choline in the form of soybean lecithin or choline dihydrogen citrate to 2 Gm. daily. The parenteral administration of crude liver extract enhances the dietary effect. Insulin appears to have a beneficial effect, too, on the storage of glycogen in the liver.

DIRECTIONS FOR APPLICATION OF DIETS

Three diets are presented with a high carbohydrate intake (350 to 550 Gm.), high protein (110 to 135 Gm.) and a minimum amount of fat (80 to 85 Gm.). The calories vary from 2,600 to 3,500. In some conditions the patient may be able to tolerate more fat, in which case we suggest butter, cream and whole milk rather than skimmed milk. The vegetables for these diets are puréed. In some cases it may be possible to allow vegetables chopped finely or even the whole vegetable. This is determined by the reaction of the individual to them. If it is necessary to lower the calories, the carbohydrate can be decreased by omitting the jells, the sugar and the fruit juices. The calories chosen will depend upon the nature of the disease, whether the patient is confined to bed or is ambulatory, and the desired weight to be maintained.

Typical Foods Allowed in Diseases of the Liver

Fine breads and cereals, rice, biscuits, crackers
Cottage cheese without cream, milk and eggs
Meats low in fat:
  Chicken
  Fish other than salmon
  Scraped beef
  Sweetbreads
  Liver
  Oyster
Potato
Vegetables—chopped finely or puréed
Fruits, cooked, without skins or seeds (canned fruits may be used), apple butter
Fruit juices and fruit ices
Desserts made without butter, cream or egg yolks, tapioca
Sugar, honey, plain candy, jams, jellies, marmalade, preserves
Beverages
Condiments: salt

Typical Foods Avoided in Diseases of the Liver

Coarse breads and cereals
Cheese other than cottage cheese
Meats high in fat:
  Pork
  Lamb
  Sardine
Coarse vegetables and fruits
Raw vegetables and fruits, salads
Rich desserts
Condiments:
  Pepper
  Catsup
  Horse-radish
  Spices, etc.
Alcoholic beverages

Chronic Hepatic Disease and Cirrhosis of Liver

Carbohydrate 350 Gm., Protein 110 Gm., Fat 80 Gm., Calories 2,600

Quantitative and Estimated Quantitative
Total Food Allowance for One Day

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	100	4 slices
Butter	15	1½ squares
Salad dressing with oil		
Milk	700	3½ glasses
Cream, 20%		
Meat (lean)	150	2 servings
Cottage cheese	100	½ cup
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	300	3 servings
Fruit, 10%, juice	600	3 glasses
Fruit, 10–15%	300	3 servings
Potato or substitute	200	2 servings
Sugar and jelly	90	6 tablespoons

Chronic Hepatic Disease and Cirrhosis of Liver

Carbohydrate 350 Gm., Protein 110 Gm., Fat 80 Gm., Calories 2,600

Suggested Distribution of the Total Food
Allowance for One Day

	BREAKFAST	
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread (toast)	2 thin slices	40
Butter	½ square	5
Jelly or sugar	2 tablespoons	30
Milk	1 scant cup	235
Beverage—coffee, tea or coffee substitute		
A.M. 10:00 Fruit juice	1 glass	200
	LUNCHEON	
Consommé (no fat) with vegetable purée	1 serving	100
Meat	1 serving	75
Potato or substitute	1 serving	100
Bread or toast	1 slice	30
Butter	½ square	5
Jelly	2 tablespoons	30
Milk	1 scant cup	235
Cottage cheese	1 serving	100
Fruit	1 serving	100
3:00 P.M. Fruit juice	1 glass	200
	DINNER	
Meat	1 serving	75
Potato or substitute	1 serving	100
Vegetable purée	2 servings	200
Bread or toast	1 slice	30
Butter	½ square	5
Jelly	2 tablespoons	30
Fruit	1 serving	100
Milk	1 scant cup	235
P.M. 8:00 Fruit juice	1 glass	200

Chronic Hepatic Disease and Cirrhosis of Liver

Carbohydrate 450 Gm., Protein 120 Gm., Fat 85 Gm., Calories 3,000

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	100	4 slices
Butter	15	1½ squares
Salad dressing with oil		
Milk	700	3½ glasses
Cream, 20%		
Meat (lean)	200	2 servings
Cottage cheese	100	1 serving
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	300	3 servings 4 glasses 3 servings
Fruit, 10%, juice	800	2 servings
Fruit, 10–15%	300	7⅔ tablespoons
Potato or substitute	200	8–10 pieces
Sugar and jelly	115	
Candy	90	

Chronic Hepatic Disease and Cirrhosis of Liver

Carbohydrate 450 Gm., Protein 120 Gm., Fat 85 Gm., Calories 3,000

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	2	100
Bread (toast)	2 thin slices	40
Butter	½ square	5
Jelly or sugar	3⅔ tablespoons	55
Milk	1 scant cup	235
Beverage—coffee, tea or coffee substitute		
A.M. 10:00 Fruit juice	1 glass	200
Candy	4–5 pieces	45
LUNCHEON		
Consommé (no fat) with vegetable purée	1 serving	100
Meat	1 serving	100
Potato or substitute	1 serving	100
Vegetable purée	1 serving	100
Bread	1 slice	30
Butter	½ square	5
Jelly	2 tablespoons	30
Fruit	1 serving	100
Milk	1 scant cup	235
Cottage cheese	1 serving	100
3:00 P.M. Fruit juice	1 glass	200
Candy	4–5 pieces	45
DINNER		
Fruit juice	1 glass	200
Meat	1 serving	100
Potato or substitute	1 serving	100
Vegetable purée	1 serving	100
Bread	1 slice	30
Butter	½ square	5
Jelly	2 tablespoons	30
Fruit	1 serving	100
Milk	1 scant cup	235
Bedtime: Fruit juice	1 glass	200

Chronic Hepatic Disease and Cirrhosis of Liver

Carbohydrate 550 Gm., Protein 135 Gm., Fat 80 Gm., Calories 3,500

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Food		*Gram Weight*	*Household Measure*
Cereal (cooked)		140	⅔ cup
Bread		100	4 slices
Butter			
Salad dressing with oil			
Milk		920	3 cups, 1 glass
Cream, 20%			
Meat (lean)		200	2 servings
Cottage cheese		100	1 serving
Egg		100	2
Vegetables, 3%	Puréed	300	3 servings
Vegetables, 6%			
Vegetables, 15%			
Fruit, 10%, juice		600	3 glasses
Fruit, 10–15%		300	3 servings
Potato or substitute		200	2 servings
Sugar or lactose		100	6⅔ tablespoons
Jelly		120	8 tablespoons
Hard candy		90	8–10 pieces
Brewer's yeast		25	5 teaspoons

Chronic Hepatic Disease and Cirrhosis of Liver

Carbohydrate 550 Gm., Protein 135 Gm., Fat 80 Gm., Calories 3,500

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

			Gm.
	BREAKFAST		
	Fruit	1 serving	100
	Cereal (cooked)	⅔ cup	140
	Egg	1	50
	Bread (toast)	2 thin slices	40
	Sugar or lactose	2 teaspoons	10
	Jelly	2 tablespoons	30
	Milk	1 cup	240
A.M. 10:00	Candy	4–5 pieces	45
	Fruit juice	1 glass	200
	Sugar or lactose	2 tablespoons	30
	LUNCHEON		
	Consommé (no fat) or vegetable purée with 5 teaspoons Brewer's yeast	1 serving	100
	Meat	1 serving	100
	Potato or substitute	1 serving	100
	Vegetable purée	1 serving	100
	Bread or toast	1 slice	30
	Jelly	3 tablespoons	45
	Fruit	1 serving	100
	Milk	1 cup	240
	Cottage cheese	1 serving	100
P.M. 3:00	Candy	4–5 pieces	45
	Fruit juice	1 glass	200
	Sugar or lactose	2 tablespoons	30
	DINNER		
	Fruit juice cocktail	1 glass	200
	Meat	1 serving	100
	Potato or substitute	1 serving	100
	Vegetable	1 serving	100
	Bread or toast	1 slice	30
	Jelly	3 tablespoons	45
	Fruit	1 serving	100
	Milk	1 cup	240
P.M. 8:00 Eggnog	Sugar or lactose	2 tablespoons	30
	Egg	1	50
	Milk	1 glass	200

JAUNDICE

Jaundice is a symptom of varying etiology and prognosis. From a nutritional point of view we shall limit the discussion to two types of jaundice, hepatocellular and obstructive.

These two types comprise about 95 per cent of all cases of jaundice.

The treatment of obstructive jaundice is fundamentally a surgical problem and consists of removal or circumvention of the obstructing lesion. The discussion of the management of this type of jaundice will be found in the chapter on preoperative and postoperative care, page 682.

Hepatocellular jaundice is that form of icterus which is produced by injury or disease of the liver cells themselves, and is an extremely common and important variety. Among the most important factors that predispose the liver cells to injury and hepatocellular jaundice are malnutrition, anoxemia and the presence of a chronic, generalized affection of the liver, thyroid disease and occasionally allergy.

Dietary Management. From a therapeutic point of view it is essential to realize that in hepatocellular jaundice, irrespective of the type, the liver parenchymal cells are damaged. The essentials of treatment are:

(1) Bed Rest. The patient should be kept in bed until the acute phase of the illness is passed (two or three weeks). He should be isolated if he suffers from epidemic hepatitis.

(2) Proper Nutrition. The institution of a proper diet is probably the most important part of the treatment of hepatocellular jaundice.

In the earlier phases of hepatocellular jaundice, if the gastro-intestinal symptoms are pronounced, the diet should consist largely of sweetened tea, fruit juice, strained cereals and rice. Toast, crackers, zwieback, potatoes, bread and similar foods may be added later. Lactose and glucose can be added to the fruit juices. If adequate carbohydrate cannot be given by mouth, the oral intake can be supplemented by a slow intravenous injection of glucose and hydrolysates. During the early, acute stages, protein feedings are best given as gelatin, albumin and skimmed milk. As the ability to digest food returns, cottage cheese, chicken and fat-free meat may be added. The intake of fat should be markedly reduced during the acute phases of jaundice, both because the diminution of bile flow makes the digestion of fat difficult and because recent knowledge indicates that fat deposition inhibits hepatic regeneration.

The diet, as soon as the acute phase subsides, should be high in carbohydrate and in protein and low in fat value. (Example, pp. 508 and 509.) This diet contains 450 Gm. of carbohydrate, 100 Gm. of protein and 30 Gm. of fat with 2,500 calories.

The carbohydrates are given in the form of sugars, honey, hard candy, fruit juices, especially orangeade or lemonade containing 10 per cent of glucose or lactose, cereals, bread and simple puddings. The protein should be in the form of egg white, skimmed milk, gelatin, cottage cheese and fresh butter, milk, soybean products and vegetables of high protein content (legumes).

An additional measure of treatment in cases of arsenical hepatitis is the use of sodium thiosulfate up to 1.0 Gm. daily, for from three to ten days, intravenously. Insulin and a high carbohydrate diet are the conventional procedure in cases of acute catarrhal jaundice.

Hepatocellular Jaundice

Carbohydrate 450 Gm., Protein 100 Gm., Fat 30 Gm., Calories 2,500

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	100	4 slices
Butter		
Salad dressing with oil		
Milk (skimmed)	900	4½ glasses
Cream, 20%		
Meat (lean)	100	1 serving
Cottage cheese	125	1 generous serving (⅔ cup)
Egg	50	1
Vegetables, 3% Vegetables, 6% Vegetables, 15% } Puréed	300	3 servings
Fruit, 10%, juice	800	4 glasses
Fruit, 10–15%	300	3 servings
Potato or substitute	200	2 servings
Sugar and jelly	105	7 tablespoons
Candy	90	8–10 pieces

Hepatocellular Jaundice

Carbohydrate 450 Gm., Protein 100 Gm., Fat 30 Gm., Calories 2,500

SUGGESTED DISTRIBUTION OF THE TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	2 thin slices	40
Jelly or sugar	2 tablespoons	
Milk (skimmed)	1 cup	240
Beverage—coffee, tea or coffee substitute		
A.M. 10:00 Fruit juice	1 glass	200
Candy	4–5 pieces	45
LUNCHEON		
Consommé (no fat) with vegetable purée	1 serving	100
Potato or substitute	1 serving	100
Cottage cheese	1 generous serving	125
Vegetable purée	1 serving	100
Bread	1 slice	30
Jelly	3 tablespoons	45
Fruit	1 serving	100
Milk (skimmed)	1 cup	240
Fruit juice	1 glass	200
P.M. 3:00 Fruit juice*	1 glass	200
Candy	4–5 pieces	45
DINNER		
Fruit juice	1 glass	200
Meat	1 serving	100
Potato or substitute	1 serving	100
Vegetable purée	1 serving	100
Bread	1 slice	30
Jelly	2 tablespoons	30
Fruit	1 serving	100
Milk (skimmed)	1 cup	240
Bedtime: Milk (skimmed)	¾ glass	180

Diseases of the Gallbladder

Nature of Disease

Inflammation of the gallbladder with or without stones

Object of Diet

To give foods that are readily assimilated with a minimum of digestive difficulty

The gallbladder is of little importance unless it becomes infected or unless a stone is present and causes trouble. Although chronic cholecystitis and cholelithiasis are separate diseases, gallstones that give clinical symptoms usually have an associated inflammation of the gallbladder. Many types of gallbladder disease require surgical intervention. However, treatment by medicine and by diet often is needed, as in the acute infections that are self-limited, in chronic gallbladder disease, and when surgical intervention is contraindicated. Dietary treatment should be followed at least from six to twelve months following surgery.

IMPORTANT FACTORS IN TREATMENT OF GALLBLADDER DISEASE

1. Fat: Low to moderately high
2. Tough or fibrous residue: To be avoided
3. Highly seasoned foods, fried foods and pastries: To be avoided
4. Protein: Normal to moderately high
5. Carbohydrate: Comparatively high and calculated to meet caloric needs

These factors need some further discussion.

Fat: Low to Moderately High. Ivy wisely suggests determination of individual tolerance to fats. The object of pushing uncooked fats, from the low to the moderately high fat intake and up to the point of tolerance, the so-called fat tolerance, of the patient is, of course, to stimulate evacuation of the gallbladder. Clinical experience proves that in an overnourished patient, a low fat reduction diet is of great value. A low fat, so-called fat-free, diet is difficult to follow for any length of time and is unnecessary except during acute attacks. Its use deprives the patient of one of the effective means of draining the gallbladder. Clinical experience also shows that very high fat diets are not well tolerated, although moderately high fat intake combined with fruit juices and meat promotes evacuation of the gallbladder through the elaboration of cholecystokinin. When there is interference with the flow of bile into the intestine, there is apt to be disturbance in the digestion of fat, and although it is the author's plan to push the emulsified fats up to the individual's tolerance, this tolerance as a rule will be only moderately high.

Tough or Fibrous Residue: To Be Avoided. Tough or fibrous foods should be avoided in order to keep the diet low in bulk. Patients with gallbladder disease have been found to tolerate foods that are bland and nonirritating. No raw vegetables, other than a small amount of crisp lettuce, ripe tomatoes without skins and seeds, and celery hearts, are permitted in the diet.

Highly Seasoned Foods, Fried Foods and Pastries: To Be Avoided. Fried foods, pastries and foods that are highly seasoned are to be avoided. Special attention is called to the list of typical foods to be avoided.

Protein: Normal to Moderately High. The author has used from approximately 60 to 80 Gm. of protein as an average protein intake.

Carbohydrate: Comparatively High and Calculated to Meet Caloric Needs. Carbohydrate is comparatively high and is tolerated best in the form of fruit juices, cereals, bread or toast, sugar or jellies. The amount used depends upon the caloric requirements of the individual and whether reduction of an associated obesity is needed.

DIRECTIONS FOR APPLICATION OF DIETS

Four diets are presented for the dietary treatment of gallbladder disease. The first two have a low fat content, 40 and 64 Gm., respectively. These diets are suggested for those who definitely do not tolerate fats, and they are generally employed in acute conditions and in the event of spasm of the sphincter Oddi. The last two diets contain a larger amount of fats, 95 and 115 Gm. for those who tolerate a higher fat intake and who require a higher caloric intake. These diets are used in chronic disease of the gallbladder, especially when there is inactivity of the gallbladder. These diets are comparatively high in carbohydrate with from 60 to 80 Gm. of protein used. The calories are 1,400, 1,800, 2,300 and 2,700. Because of the frequent association of obesity, there may be need of a lower caloric intake than 1,400 calories. This can be met by decreasing the sugar and the fruit juices. If necessary, all the butter and part of the bread may be omitted. This would reduce the caloric intake to between approximately 1,000 and 1,200 calories.

The typical foods allowed in diseases of the gallbladder are the same as those in the bland diet on page 712. When eggs cannot be used in the diet, an additional ounce of meat or one glass of milk should be taken in the place of the egg.

Typical Foods to Be Avoided in Diseases of the Gallbladder

Fats, especially the fats of pork, veal, salmon, mutton and sardine
All fried, greasy foods
Spices and condiments other than salt
Pastry, pie and rich cake
The gaseous vegetables, such as cabbage, turnip, rutabaga, broccoli, etc., page 454.

CHOLESTEROL IN THE DIET IN DISEASES OF THE GALLBLADDER

With the advent of biochemistry it was believed that high fat diets were deleterious, in that the sequence of events of cholesterolemia increased elimination of cholesterol in the bile and precipitation of cholesterol represented the essential step in the pathogenesis of gallstones. Present knowledge does not sustain this point of view.

From our knowledge of the complexity of the metabolisms of cholesterols, cholesterol esters, bile acids and bile salts, which is greatly limited, it appears that there is little prospect of modifying by medical or dietetic measures the development or course of cholecystic disease or the formation of gallstones which so frequently complicates the clinicopathologic picture.

High and Low Cholesterol Diets. In spite of the above, some authors are of the opinion that the use of a high cholesterol diet or a low cholesterol diet in gallbladder disease is dependent upon the nature of the disease. For instance, a low cholesterol diet is indicated in patients who have cholelithiasis, hypercholesteremia and chronic infection of the gallbladder and for those who have undergone surgery. Patients who have a nonfunctioning gallbladder with obstruction of the cystic duct should also have a low cholesterol diet.

A high cholesterol diet is indicated for and usually well tolerated by patients who have a diseased gallbladder which is functioning and no associated hypercholesteremia or cholelithiasis.

A low cholesterol diet, if continued over a long period of time, may result in a vitamin A deficiency, since foods that provide the largest amount of vitamin A are high in cholesterol.

Twiss and Greene have felt that in the study of gallbladder disease it is important to determine the cholesterol content of the blood. When the blood is high in cholesterol, it may be wise to exclude from the diet foods rich in cholesterol, such as brain, liver, eggs, butter, goose, duck, sweetbreads, cream, fat meats and sausage.

ADJUNCTS TO DIETARY TREATMENT OF GALLBLADDER DISEASE

Cholagogues and Choleretics. The cholagogues are those substances which increase the flow of bile by inducing emptying of the gallbladder. Choleretics include those substances, chiefly the bile acids, which increase the flow of bile by directly stimulating the liver to secrete more bile. Ketocholanic acid, the oxidation product of the natural bile acid, has apparently the lowest toxicity. Neubauer states that these drugs increase the flow of bile from 100 to 200 per cent. They are often used in the treatment of gallbladder disease. Some clinicians, in resistive cases, place the patient on a starvation diet, principally fluids of little or no caloric content, and give cholagogues in large amounts. Olive oil is considered by some clinicians as a cholagogue and a high fat, olive-oil diet is sometimes prescribed.

Antispasmodics. Many feel that the use of antispasmodics is a very essential adjunct in treatment. Particularly is this true when the distention of the biliary ducts is due to spasm of the sphincter Oddi. Drugs such as magnesium salts, especially the sulfate, sodium phosphate and sodium sulfate, are effective. Magnesium sulfate seems to be the most active, but if continued for any length of time produces bowel disturbance. Magnesium oxide is better tolerated but less efficient. Magnesium sulfate acts more promptly when administered by the duodenal tube, although oral administration is also efficient.

Other drugs that may be utilized include those that depress the vagus and smooth muscle. Atropine, belladonna, nitrites, nitroglycerin and calcium also possess these antispasmodic properties. Atropine usually fails, while nitroglycerin is most effective. Morphine is usually not necessary and in small doses actually aggravates the spasm.

Many different types of antispasmodics are on the market. The author suggests one, used by Brown, which has proven to be very useful: tincture of belladonna drams eight, elixir sodium phenobarbital (grain ½ per dram one) q. s. ad fluid ounces eight, using one dram diluted with water after each meal.

Biliary Drainage. After Meltzer's observation on the evacuation of the gallbladder and the clinical work of Lyon and many others, medical drainage of the gallbladder and the biliary system became established as a diagnostic and therapeutic measure, but as Lyon has stated, "Once the definitely chronic state is reached, the final therapeutic cure is secured only by surgical procedure aided by adequate medical measures directed toward lowering operative mortality and lessening postoperative morbidity."

European Spas. The European spas use a meticulous diet combined with alkaline water and salines.

Exercise. Exercise, particularly after meals, is often recommended in some gallbladder conditions.

MEDICAL TREATMENT OF GALLBLADDER DISEASE

The aim of medical treatment of gallbladder disease should be to restore the normal functioning of a diseased gallbladder. A brief description of the normal physiology of the gallbladder and its abnormal functioning in disease is in order.

The function of the gallbladder is to store and concentrate bile and to equalize pressure within the biliary passages. By virtue of the growth, muscle and elastic tissue in the wall of the gallbladder and the common duct, the gallbladder and the common bile duct contract in a rhythmic fashion. This muscular co-ordination causes the bile to be discharged from the gallbladder through the cystic and the common ducts into the duodenum. At the end of the common duct, as it enters the duodenum, is the sphincter of Oddi. There is likewise normally a co-ordinated mechanism between the contraction of the gallbladder and the relaxation of the sphincter. Emulsified fats, cream, butter and egg yolk stimulate the formation of the active hormone cholecystokinin, which contracts the gallbladder and also tends to relax the sphincter of Oddi and thus increases the motor activity of the biliary tract.

When there is a disturbance of the normal muscular co-ordination with either a lazy, diminished contraction of the gallbladder or a spasm of the sphincter of Oddi, bile stasis occurs with the possibility of infection or even calculi formation.

Management of Acute Biliary Colic. After an attack, patients should receive hot tea with lemon, hot sugar water, cereals with skimmed milk and toasted white bread. Applesauce may be added later. Gradually the diet may be increased, as outlined in the low fat diets on pages 516 to 519 for gallbladder disease. Should there be evidence of an acute, virulent infection in the gallbladder—the gallbladder tender and palpable with leukocytosis and fever—the condition may become a surgical problem.

Chronic cholecystitis may be due to untreated disturbance of muscular co-ordination between contraction of the gallbladder or spasm of the sphincter of Oddi, or to an invasion of the gallbladder by micro-organisms.

When the diagnosis of calculus cholecystitis is established, the generally accepted view is that cholecystectomy is the management of choice. However, in the noncalculous cholecystitis, management is usually medical. The physician should attempt (1) to eliminate foci of infection (infected teeth, tonsils), (2) to correct stasis and to promote the free flow of bile, (3) to relieve dyspepsia and biliary spasms and (4) to regulate elimination.

The control of the diet is of great importance. In cases of spasm of the sphincter, a bland diet containing a minimum amount of fat (40 to 65 Gm.), meats and fruits, such as the low fat diets, pages 516 to 519, is advisable. This diet will prevent activity of the gallbladder. Alcohol, highly seasoned foods, spices, pickles, condiments, fried foods, fatty meats such as pork and sausage, fatty fish such as herring, mackerel, salmon and sardines, fatty cheeses and rich dressings—all should be avoided. Antispasmodics (belladonna, syntropan, novatropine) are useful. Since emotional disorders may be in the background of the spasm of the sphincter of Oddi, small doses of phenobarbital, mental hygiene, plenty of sleep, a normal amount of exercise, fresh air, play and freedom from worry might prove helpful. A similar bland, easily digestible low fat diet is prescribed for patients suffering from latent low-grade inflammation of the gallbladder. The diet should also be high in protein and in carbohydrate, especially when the episodes of acute symptoms are frequent and hepatitis is present. (See diets for hepatocellular jaundice, page 508.)

In cases of lazy, inactive gallbladder, or chronically diseased gallbladder without active infection, a stimulating diet is preferable. The diet should contain fats and oils, since they best stimulate the emptying of the biliary tract. Olive oil may be given between meals or on waking to facilitate evacuation of bile from the gallbladder. Often, however, the high fat diet proves upsetting, so that it is advisable to determine the fat tolerance of the patient before subjecting him to that diet. Such diets, with increasing fats, are outlined on pages 516 to 523. The diet then should contain only moderate amounts of fat—not enough to induce symptoms. The high fat diet includes milk, cream, butter and eggs, which make the diet palatable and supply vitamins A and D. It is a good idea to supplement the low fat diet with vitamins A, D and K. The protein should be about 80 Gm. per day, for protein is needed for the formation of bile salts. Lean beef, chicken, mutton and whitefish may be permitted in moderate quantities. The patient should be encouraged to eat small meals and should not omit a meal. Fluids should be ingested in large quantities in the morning, between meals and before retiring at night.

Foods rich in cholesterol—egg yolk, liver, sweetbreads, oysters, fish roe and lard—should be excluded.

The stimulation of the flow of bile is promoted by high fat foods, especially butter, cream and olive oil. The additional use of bile salts (sodium glycocholate, sodium taurocholate or those contained in fel bovis) is advocated by some clinicians, although Ivy has shown that bile salts have no effect on gallbladder emptying. However, he and his associates have shown that the administration of natural bile acids (cholic, desoxycholic acids, etc.) in conjugated form increases the output of natural bile acids by the liver as well as the excretion of cholesterol and pigment. On the other hand, the unconjugated pure bile acids (dehydrocholic, triketocholanic acids) increase the production of thin liver bile, which flushes the bile duct system. Bile salts are particularly useful in combination with a stimulating high fat diet.

The administration of dilute hydrochloric acid in such cases is sometimes of great help.

To regulate elimination, saline cathartics (soda phosphate, magnesium sulfate) tend to relax the sphincter of Oddi and permit the flow of bile. Saline cathartics are especially effective in chronic cases with mild spasm of the sphincter. The various forms of spa therapy owe their reputation to the mineral salts in the waters of the particular place. Laxatives and enemas are rarely needed. When required, a little mineral oil at night will suffice.

Medical treatment of gallbladder disease, which should include the dietary procedure outlined above, perhaps combined with choleretics and cholagogues, and possibly antispasmodics, may be applied or utilized in the management of the following three groups of patients:

1. The so-called surgical cases, with no contraindications, requiring surgical treatment combined with preoperative and postoperative medical care.

2. Those cases needing surgery, with such contraindications as age, cardiac disease, renal disease, diabetes mellitus and neuropsychiatric conditions, all requiring medical treatment and many of them remediable.

3. Those cases concerning which both surgeon and internist agree medical management alone is indicated.

Limitation. The physician will do well to bear in mind the limitations of the therapeutic methods available in treating gallbladder disease. In cases of noncalculous chronic cholecystitis, medical treatment should by all means be given an adequate trial, as improvement by surgery takes place in only from about 30 to 60 per cent of cases. However, the internist must be careful not to subject his patient too long to a medical regimen which is failing completely when early surgical intervention may restore the patient to health. The surgeon can expect satisfactory results from surgery in from about 85 to 90 per cent of cases of cholecystitis with stones. The remaining 10 to 15 per cent, although possibly relieved from pain, will continue to suffer from indigestion, food intolerance and constipation necessitating the internist's medical supervision.

Low Fat Diet

40 Gm. Fat
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 200, Protein 60, Fat 40, Calories 1,400

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	100	4 slices
Butter	15	1½ squares
Salad dressing with oil		
Milk (skimmed)	600	3 glasses
Cream, 20%		
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	50	1
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, juice	200	1 glass
Fruit, 10–15%	300	3 servings
Potato or substitute	75	1 small serving
Sugar	15	1 tablespoon

Low Fat Diet

40 Gm. Fat
1,400 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Toast	2 thin slices	40
Butter	½ square	5
Milk (skimmed)	1 glass	200
Sugar	1 tablespoon	15
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Clear soup (no fat)	1 serving	(if desired)
Vegetables	1 serving	100
Bread or toast	1 slice	30
Butter	½ square	5
Fruit	1 serving	100
Milk (skimmed)	1 glass	200
DINNER		
Fruit juice	1 glass	200
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetables	2 servings	200
Bread	1 slice	30
Butter	½ square	5
Milk (skimmed)	1 glass	200
Fruit	1 serving	100

Low Fat Diet

65 Gm. Fat
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 246, Protein 71, Fat 65, Calories 1,865

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	100	4 slices
Butter	20	2 squares
Salad dressing with oil		
Milk	600	3 glasses
Cream, 20%	30	2 tablespoons
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	50	1
Cheese, cottage	60	1 serving (2 oz.)
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, juice	200	1 glass
Fruit, 10–15%	300	3 servings
Potato or substitute	100	1 serving
Sugar	10	2 teaspoons
Dessert	100	1 serving

Low Fat Diet

65 Gm. Fat
1,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	2 thin slices	40
Butter	½ square	5
Milk	1 glass	200
Cream, 20%	2 tablespoons	30
Sugar	2 teaspoons	10
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Clear soup (no fat)	(if desired)	
Cheese, cottage	1 serving	60
Vegetable	1 serving	100
Bread	1 slice	30
Butter	½ square	5
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Fruit juice	1 glass	200
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetables	2 servings	200
Salad: fruit	1 serving	100
Bread	1 slice	30
Butter	1 square	10
Milk	1 glass	200
Dessert	1 serving	100

High Fat Diet

95 Gm. Fat
2,300 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 284, Protein 77, Fat 96, Calories 2,305

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	100	4 slices
Butter	40	4 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Cheese, cottage	90	1 serving (3 oz.)
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, juice	400	2 glasses
Fruit, 10–15%	300	3 servings
Potato or substitute	100	1 serving
Sugar, jelly or jam	45	3 tablespoons
Dessert	100	1 serving

High Fat Diet

95 Gm. Fat
2,300 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	2 thin slices	40
Butter	1 square	10
Cream, 20%	¼ cup	60
Jelly or jam	2 tablespoons	30
Sugar	1 tablespoon	15
Beverage		
LUNCHEON		
Fruit cocktail	1 serving	100
Egg or substitute	1	50
Cheese, cottage	1 serving	90
Vegetable	1 serving	100
Bread	1 slice	30
Butter	1½ squares	15
Milk	1 glass	200
P.M. 3:00 Fruit juice	1 glass	200
DINNER		
Fruit juice	1 glass	200
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetables	2 servings	200
Salad: fruit	1 serving	100
Bread	1 slice	30
Butter	1½ squares	15
Milk	1 glass	200
Dessert	1 serving	100

High Fat Diet

115 Gm. Fat
2,700 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 339, Protein 77, Fat 116, Calories 2,705

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	100	4 slices
Butter	60	6 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Cheese, cottage	90	1 serving (3 oz.)
Vegetables, 3% Vegetables, 6%	300	3 servings
Fruit, 10%, juice	800	4 glasses
Fruit, 10–15%	300	3 servings
Potato or substitute	100	1 serving
Sugar, jelly or jam	60	4 tablespoons
Dessert	100	1 serving

High Fat Diet

115 Gm. Fat
2,700 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	2 thin slices	40
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar and jam	2 tablespoons	30
Beverage—coffee, tea or coffee substitute		
A.M. 10:00 Fruit juice	1 glass	200
LUNCHEON		
Egg or substitute	1	50
Cheese, cottage	1 serving	90
Vegetable	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Jelly or jam	2 tablespoons	30
Fruit	1 serving	100
P.M. 3:00 Fruit juice	1 glass	200
DINNER		
Fruit juice	1 glass	200
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetables	2 servings	200
Salad: fruit	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Dessert	1 serving	100
P.M. 8:00 Fruit juice	1 glass	200

Diseases of the Intestines

DIARRHEA

Nature of Disease

A condition of increased motility with or without irritation of the intestines

Object of Diet

To allay the irritation and inhibit motility of the intestines

Diarrhea is a symptom of a condition in which there is increased motility of the intestine that results in too rapid a movement of material with too frequent stools. Many underlying conditions must be considered in differentiating the possible etiologic factors. A common cause is food poisoning, food idiosyncrasy or overindulgence in foods that are laxative in character. There are also various specific and nonspecific infectious factors—parasitic, toxic, such as poisons from arsenic, mercury and iodides; the so-called diarrhea nervosa associated with the unstable nervous system; lack of hydrochloric acid; diarrheas associated with hyperthyroidism; simple irritable bowels with unstable colon—and many other types that have no known etiology.

Important Factors in Dietary Treatment of Diarrhea

1. Complete rest from food during the first twenty-four to forty-eight hours of acute stage, followed by the feeding of
2. Liquid to semiliquid foods
3. Low-residue and nonirritating foods
4. Avoidance of substances which stimulate peristalsis

These factors need some further discussion.

Complete Rest from Food During the First Twenty-four to Forty-eight Hours. In cases of acute diarrhea caused by improper food, complete rest from any food during the first twenty-four hours to sometimes forty-eight hours will often be sufficient to quiet the intestinal tract. This abstinence from food is very important. In addition, the patient should be kept absolutely at rest in bed with heat to the abdomen every alternate hour.

Liquid to Semiliquid Foods. The food that is given should be liquid or semiliquid and should be given in very small feedings at first. In the acute phase of the diarrhea, water should be restricted at first or given only in small amounts. Thirst is often satisfied by giving cracked ice. In the chronic phase of the diarrhea with a tendency to dehydration, large volumes of fluid are indicated. Later, boiled milk, clear broths, strained orange juice, tea, beef tea, cereal gruels, soft eggs and boiled or poached eggs may be added.

Low-Residue and Nonirritating Foods. Foods low in residue and those that will cause the least irritation should be chosen. Any food that leaves considerable bulk may mechanically irritate the bowel. Coarse vegetables and raw fruits are always to be avoided. When vegetables are first added to the diet, they should be puréed.

Avoidance of Substances Which Stimulate Peristalsis. Many foods, such as cider, sauerkraut and the like, possess certain chemical properties which tend to stimulate peristalsis and they should be avoided.

Directions for Application of Diets

At the onset of acute diarrhea, complete rest from food is necessary for from twenty-four to forty-eight hours. Occasionally sips of water or cracked ice may be tolerated. The patient also may be able to take very small sips of strained orange juice, boiled milk, clear broth or tea. When appetite returns, the diarrhea improves and food is better tolerated, the patient may be placed on a diet such as has been suggested for acute diarrhea. The author realizes that this diet for acute diarrhea is too low in protein and calories for the average individual for a long period of time. A gradual increase in the diet from the one for acute diarrhea to one of the four outlined for chronic diarrhea should be made. If the diarrhea is merely of an acute form and of very short duration, a quick return may be made to a normal regimen.

When diarrhea becomes chronic, the author has suggested four diets, two containing 60 Gm. of protein with 1,800 and 2,200 calories, and two containing 70 Gm. of protein with 2,200 and 2,600 calories.

The typical foods to be emphasized and those to be avoided in the treatment of chronic diarrhea are the same as those used in the bland diet on page 712.

FLATULENCE

Flatulence, perhaps, is a symptom more commonly associated with more gastro-intestinal complaints than any other. The patient is definitely convinced that it is gas which causes his distress. The swallowing of air often is a factor, especially in an individual with a neurotic background. It is also true that in certain instances there is excessive formation of gas from fermentative or putrefactive changes.

The real cause is not so much the excess of gas as it is an excess of tonicity of the stomach or intestine with stimulated peristalsis moving the gas from point to point, often with the sensation of extreme tension and too often colic. The factor behind the unrest is the irritability of the sympathetic nervous system, which may or may not be associated with an irritable or inflamed intestinal mucosa.

Patients easily acquire the habit of lessening their consciousness of intestinal tension by belching or passing flatus. There may be no difficulty in aiding the patient if he is given to understand that the act of eructation or the escape of gas is not necessary.

FERMENTATION

In cases in which fermentation in the intestinal tract is responsible for flatulence, regulation of the diet will often help. Certain vegetables, particularly shelled beans, peas, corn and potatoes, the cabbage family, melons, onions, cucumbers and radishes, produce flatulence in susceptible people. Reduction in starches is advisable. Proper cooking and puréed foods often help and allow the patient to use some of the above foodstuffs that otherwise must be omitted. Coffee is a factor in some patients. In fermentation one should include more protein foods, egg, meat, soups and milk.

PUTREFACTION

If, on the other hand, putrefactive processes predominate and there is evidence in the alkaline stools of poor digestion of meat with presence of muscle fibers and connective tissue in considerable amounts, the meat should be removed as far as possible. The food in such cases should be rich in carbohydrate with definite restriction of the protein. Intestinal putrefaction may predispose to pyelitis. Indicanuria is often present.

MUCOUS COLITIS

Mucous or pseudomembranous colitis is not a definite disease or colitis, but a syndrome deriving its name from the fact that it is characterized by the passage of mucus with or without stool. There is associated usually a spastic constipation and generally an instability of the vegetative nervous system. The treatment of mucous colitis is the use of a bland, nonirritating diet, such as is outlined for spastic constipation, pages 334 to 343.

40 Gm. Protein
1,400 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 115, Protein 40, Fat 85, Calories 1,385

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	105	½ cup
Bread	60	3 thin slices
Butter	40	4 squares
Salad dressing with oil		
Milk (boiled)	600	3 glasses
Cream, 20%	60	¼ cup
Meat (lean)		
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% } puréed	75	about ½ cup
Fruit, 10%, juice	300	1½ glasses
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		
Sugar	5	1 teaspoon

40 Gm. Protein
1,400 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit juice, strained	½ glass	100
Cereal (cooked)	½ cup	105
Bread (toast)	1 thin slice	20
Butter	1 square	10
Cream, 20%	¼ cup	60
Sugar	1 teaspoon	5
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Egg	1	50
Bread (toast)	1 thin slice	20
Butter	1 square	10
Fruit juice, strained	½ glass	100
Milk (boiled)	½ glass	100
P.M. 3:00 Milk (boiled)	1 glass	200
DINNER		
Soup:		
Vegetable purée	about ½ cup	75
Milk	½ glass	100
Butter	1 square	10
Egg or cottage cheese	1	50
Bread (toast)	1 thin slice	20
Butter	1 square	10
Milk (boiled)	1 glass	200
Fruit juice, strained	½ glass	100

60 Gm. Protein
1,800 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 210, Protein 60, Fat 80, Calories 1,800

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	30	3 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (1 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% } puréed	300	3 servings
Fruit, 10%, juice	200	1 glass
Fruit, 10%		
Vegetables, fruit, 15–20%	200	2 servings
Potato or substitute	150	2 small servings
Sugar and jam	30	2 tablespoons

60 Gm. Protein
1,800 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit juice	½ glass	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 slice	30
Butter	1 square	10
Sugar	1 tablespoon	15
Jelly	1 tablespoon	15
Cream, 20%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Egg or egg substitute	1	50
Vegetable purée	1 serving	100
Potato or substitute	1 small serving	75
Bread	1 slice	30
Butter	1 square	10
Milk	1 glass	200
Fruit, cooked	1 serving	100
DINNER		
Fruit juice	½ glass	100
Meat	1 serving	60
Vegetable purée	2 servings	200
Potato	1 small serving	75
Bread	1 slice	30
Butter	1 square	10
Milk	1 glass	200
Fruit, cooked	1 serving	100

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 250, Protein 60, Fat 105, Calories 2,185

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	50	5 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	300	3 servings
Fruit, 10%, juice	400	2 glasses
Fruit, 10%		
Vegetables and fruit, 15–20%	200	2 servings
Potato or substitute	100	1 serving
Dessert	100	1 serving
Sugar or jelly	30	2 tablespoons

60 Gm. Protein
2,200 Calories

Total Food Allowance for One Day
Allowance for One Day

		Gm.
BREAKFAST		
Fruit juice strained	1 glass	200
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Sugar and jelly	2 tablespoons	30
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Fruit juice	1 glass	200
Egg or substitute	1	50
Vegetable purée	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable purée	2 servings	200
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Fruit	1 serving	100
Dessert	1 serving	100

70 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 225, Protein 70, Fat 115, Calories 2,215

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	45	4½ squares
Salad dressing with oil		
Milk	500	1 pint, or 2½ glasses
Cream, 20%	120	½ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	300	3 servings
Fruit, 10%, juice	200	1 glass
Fruit, 15–20%	200	2 servings
Potato or substitute	150	2 small servings
Sugar	10	2 teaspoons
Dessert	100	1 serving

70 Gm. Protein
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Orange juice, strained	½ glass	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Sugar	2 teaspoons	10
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Orange juice, strained	½ glass	100
Egg or substitute	1	50
Vegetable purée	1 serving	100
Potato or substitute	1 small serving	75
Bread	1 slice	30
Butter	1½ squares	15
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Soup:		
Vegetable purée	½ cup	100
Milk	½ glass	100
Cream, 20%	¼ cup	60
Meat	1 serving	60
Potato or substitute	1 small serving	75
Vegetable purée	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Milk	1 glass	200
Fruit	1 serving	100
Dessert	1 serving	100

70 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 300, Protein 70, Fat 125, Calories 2,605

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	65	6½ squares
Salad dressing with oil		
Milk	600	3 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon		
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	300	3 servings
Fruit, 10%, juice	300	1½ glasses
Fruit, 15–20%	200	2 servings
Potato or substitute	200	2 servings
Sugar or jelly	60	4 tablespoons
Dessert	100	1 serving

70 Gm. Protein
2,600 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

	BREAKFAST	
		Gm.
Orange juice, strained	½ glass	100
Cereal (cooked)	⅔ cup	140
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar and jelly	2 tablespoons	30
Beverage—coffee, tea or coffee substitute		
	LUNCHEON	
Orange juice, strained	½ glass	100
Egg or substitute	1 serving	50
Potato or substitute	1 serving	100
Vegetable purée	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Jelly	1 tablespoon	15
Milk	1 glass	200
Fruit	1 serving	100
P.M. 3:00 Milk	1 glass	200
	DINNER	
Orange juice, strained	½ glass	100
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable purée	2 servings	200
Bread	1 slice	30
Butter	2½ squares	25
Jelly	1 tablespoon	15
Milk	1 glass	200
Fruit	1 serving	100
Dessert	1 serving	100

Diseases of the Intestines *(Continued)*

ULCERATIVE COLITIS

Nature of Disease

Inflammation of the large intestine in which ulceration usually predominates

Object of Diet

To furnish a concentrated, high caloric, high vitamin diet free from irritating food

Ulcerative colitis is characterized by chronic inflammation of the mucous membrane and walls of the large intestine, in which ulceration usually predominates. The ulceration usually begins in the rectum. It spreads upward and may involve the entire colon. However, in tuberculous ulcerative colitis, the lesion usually begins in the terminal portion of the ileum and in the cecum. There are many forms of chronic ulcerative colitis. The term is best used to denote a general syndrome rather than to confine it to one of the specific disease entities in which this syndrome is developed. All forms of ulcerative colitis assume in their very nature the status of chronic disease. The course of the condition is generally long and chronic, but the symptoms are intermittent.

Chronic ulcerative colitis may develop as a result of infection by one or more of several bacterial and animal parasites, or in association with certain dietary and constitutional deficiencies, or as a result of poisoning with certain chemicals. In medical practice, it becomes necessary to attempt to classify cases of chronic ulcerative colitis according to etiologic types, and the first and most fundamental clinical effort is directed at determining, if possible, the specific etiologic factor responsible for the development of the syndrome so that a more rational therapy may be instituted.

Although the specific medical management of ulcerative lesions of the colon varies, depending upon the etiologic factor responsible for the ulceration, the dietary principles are fundamentally the same, irrespective of the causative factors of the ulcerative lesions.

IMPORTANT FACTORS IN DIETARY TREATMENT OF ULCERATIVE COLITIS

1. Calories: High
2. Protein: High
3. Residue: Low and nonirritating
4. Vitamins: High

These factors need some further discussion.

Calories: High. The caloric requirement is high because the condition hastens the food mixture through the small intestine before digestion is completed and interferes with food absorption.

Protein: High. A high protein intake is necessary because of the repair value of protein and because of the need of low residue. The protein foods are also high in iron. This is important when there is an associated anemia due to hemorrhage from the ulcerative lesions. In these cases it is wise to use liver at least three or four times a week.

Residue: Low and Nonirritating. The diet for acute ulcerative colitis is low residue, almost residue-free, containing no fruits or vegetables. When puréed vegetables and strained fruits are added, the diet must still remain a low-residue one. In severe cases the patient may receive nothing but boiled milk, two quarts daily, to which are gradually added thin slices of toasted white bread and a little fine cereal, egg, cheese and tender cuts of meat, fish or poultry.

Vitamins: High. The chronicity of the disease demands that the supply of vitamins be considered. The use of orange juice, tomato juice, Brewer's yeast, cod-liver or halibut-liver oil should be considered. Many cases will require parenteral injections of high concentrates of B complex and liver extract.

DIRECTIONS FOR APPLICATION OF DIETS

The author has outlined three diets for ulcerative colitis. These represent three stages in the progress of the dietary regimen. The patient should be placed for the first two or three days on Diet 1, which contains 6 Gm. of protein and 2,000 calories with no fruits or vegetables. In the acute stage of ulcerative colitis it may be difficult to induce some patients to take all of this first diet; others may be able to take more food. Many of these patients may be emaciated. Every effort should be made to have them take all food possible. As soon as it seems advisable, additional vitamins in the form of Brewer's yeast, cod-liver or halibut-liver oil should be incorporated.

It is important to give a high protein, high caloric intake. A change should not be made abruptly from Diet 1 to Diet 2 or from Diet 2 to Diet 3. Gradual additions of food are made to Diet 1 until the patient is able to take all of Diet 2. To do this the author suggests the gradual addition of one article of food every two or three days, chosen from banana, orange juice, puréed vegetables, milk and butter, until by the end of the first ten days or two weeks the patient is on a diet containing about 75 Gm. of protein with 2,500 calories, as suggested in Diet 2. After the patient is able to take all of Diet 2, additional food may be added each day, bland fruits such as cooked pears, apricots, peaches, strained applesauce, etc., and whole vegetables in place of puréed vegetables being permitted. This gradual increase in the diet is made until the patient at the end of from three to six weeks should be able to follow a diet as outlined in Diet 3, containing 80 Gm. of protein and 3,000 calories. The need of protein and calories will be an individual matter.

The typical foods to emphasize and those to avoid in the treatment of ulcerative colitis are the same as those for the bland diet on page 712.

DETAILED EXAMPLE AS TO HOW THE DIET MAY BE INCREASED FROM DAY TO DAY

For two or three days: Diet 1
Fourth day: Add one banana
Sixth day: Add a quarter of a glass of orange juice

Eighth day: Add one serving of puréed vegetable

Tenth day: Diet 2

As soon as the patient is able to take all of Diet 2 each day, the size of each serving of the various foods allowed should be increased until all of Diet 3 is being taken. This diet should be continued indefinitely.

PRESENT STATUS OF ULCERATIVE COLITIS

During the past few years there has been much discussion as to the types of colitis associated with ulcerative lesions. Ulcerative colitis, as previously stated, involves the large intestine, particularly its distal segments. However, the type of colitis emphasized by Crohn is localized at the terminal ileum and cecum. It is also well known that the great majority of tuberculous ulcerations of the bowel are situated in the region of the lower ileum, cecum and ascending colon.

In order to cover briefly the present status of ulcerative colitis, the author merely lists seven major types of colitis that may have an associated ulcerative lesion:

1. Amebic dysentery
2. Chronic ulcerative colitis, idiopathic or due to cocci
3. Tuberculous colitis
4. Bacillary dysentery
5. Type of colitis emphasized by Crohn in which one deals with definite infective processes localized at the terminal ileum and cecum
6. Regional (segmental) ulcerative colitis
7. Ulcerative colitis due to virus of venereal lymphogranuloma.

Low Residue Diet 1

60 Gm. Protein
2,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 195, Protein 60, Fat 110, Calories 2,010

Food	*Gram Weight*	*Household Measure*
*Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	55	5½ squares
Salad dressing with oil		
Milk		
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 ozs.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3%		
Vegetables, 6%		
Fruit, 10%		
Vegetables and fruit, 15%		
Potato or rice	200	2 servings
Sugar	30	2 tablespoons
Dessert	200	2 servings

* Cream of Wheat, Farina, strained oatmeal, puffed rice, puffed wheat, cornflakes, Rice Krispies.

Low Residue Diet 1

60 Gm. Protein
2,000 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
	BREAKFAST	
Cereal (cooked)	⅔ cup	140
Bacon	2 slices	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	1½ squares	15
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jelly	1 tablespoon	15
Beverage—coffee, tea or coffee substitute		
	LUNCHEON	
Meat	1 serving	60
Potato or rice	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
*Dessert	1 serving	100
	DINNER	
Meat	1 serving	60
Potato or rice	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
*Dessert	1 serving	100

* Bland desserts such as custards, cornstarch puddings, junkets, gelatin desserts without nuts, or fruit, plain rice, tapioca, or bread puddings, simple cakes, cookies and plain ice cream.

Low Residue Diet 2

75 Gm. Protein
2,500 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
ALLOWANCE FOR ONE DAY

Carbohydrate 260, Protein 75, Fat 130, Calories 2,510

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	60	6 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3% Vegetables, 6% Vegetables, 15% } puréed	200	2 servings
Fruit, 10% orange juice	150	¾ glass
Banana, ripe	100	1 medium sized
Potato or rice	200	2 servings
Sugar and jelly	30	2 tablespoons
Dessert	200	2 servings

Low Residue Diet 2

75 Gm. Protein
2,500 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
BREAKFAST		
Orange juice	¼ glass	50
Sliced banana, ripe	1 medium	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices, crisp	10
Egg	1	50
Toast	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jelly	1 tablespoon	15
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Milk soup:		
Milk	¾ glass	150
Vegetable purée	½ cup	100
Salt		
Meat	1 serving	60
Potato or rice	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Milk	½ glass	100
Dessert	1 serving	100
Orange juice	¼ glass	50
DINNER		
Meat	1 serving	60
Potato or rice	1 serving	100
Vegetable purée	1 serving	100
Bread	1 slice	30
Butter	2 squares	20
Milk	⅔ glass	150
Dessert	1 serving	100
Orange juice	¼ glass	50

Low Residue Diet 3

80 Gm. Protein
3,000 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 300, Protein 80, Fat 165, Calories 3,005

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	85	8½ squares
Milk	600	3 glasses
Cream, 20%	160	¾ glass
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices, crisp
Egg	50	1
Vegetables, 3% Vegetables, 6% Vegetables, 15%	300	3 servings
Fruit, 10% orange juice	300	1½ glasses
Vegetables, fruit, 15–20%	200	2 servings
Potato or substitute	200	2 servings
Sugar and jelly	60	4 tablespoons
Dessert	100	1 serving

Low Residue Diet 3

80 Gm. Protein
3,000 Calories

Suggested Distribution of Total Food Allowance for One Day

		Gm.
	BREAKFAST	
Orange juice	½ glass	100
Sliced banana	1 medium sized	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices, crisp	10
Toast	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar	1 tablespoon	15
Jelly	2 tablespoons	30
Beverage—coffee, tea or coffee substitute		
A.M. 10:00 Milk	¾ glass	150
Cream	¼ glass	50
	LUNCHEON	
Meat or substitute	1 serving	60
Potato or substitute	1 serving	100
Vegetable	1 serving	100
Bread	1 slice	30
Butter	3 squares	30
Milk	¾ glass	150
Jelly	1 tablespoon	15
Dessert	1 serving	100
Orange juice	½ glass	100
P.M. 3:00 Milk	¾ glass	150
Cream	¼ glass	50
	DINNER	
Consommé with vegetable purée	1 serving	100
Meat	1 serving	60
Potato or substitute	1 serving	100
Vegetable	1 serving	100
Bread	1 slice	30
Butter	3½ squares	35
Milk	¼ glass	150
Fruit	1 serving	100
Orange juice	½ glass	100

Diseases of the Intestines *(Continued)*

DIVERTICULOSIS AND DIVERTICULITIS

Nature of Condition

Pouching of intestinal coats due to weakness of coats, which may become inflamed

Object of Diet

To furnish a diet with a residue that will not irritate the pouches

Diverticula appear at weak points in the intestinal wall, often at the point of entrance of vessels. Diverticula are prone to develop in the descending colon and sigmoid. Diverticulosis is a condition in which many diverticula are found either by roentgenologic examination or by surgery. Although a diverticulum may cause no symptoms, a great deal of distress may occur when diverticulitis develops from diverticulosis due to infection and irritation. A diverticulum rarely presents symptoms adequate to focus the clinician's attention on it: it is often discovered at the time of a gastro-intestinal series of roentgenograms.

Important Factors in Dietary Treatment of Diverticulosis and Diverticulitis

1. Diet: Nonconstipating
2. Seeds, skins and fibrous foods: To be avoided.

Directions for Application of Diets

Diverticula in the intestine demand no greater attention than does an appendix or gallbladder, except that in the case of appendix or gallbladder there is only one pouch to become inflamed, while in diverticulosis there are multiple pouches. In spite of the greater number of pouches, acute diverticulitis is clinically far less frequent than diseases of the appendix or the gallbladder.

In cases of diverticulosis not acutely inflamed it is well to place the patient on the ambulatory diet outlined so as to lessen the tendency to irritation of the pouches by the food ingested. The author has suggested a diet containing 65 Gm. protein, 2,600 calories. Special effort should be made to avoid seeds, skins, fibrous foods and foods containing a large amount of roughage. This diet is at the same time nonconstipating.

In cases of diverticulitis there should be complete rest from food, as in the treatment of appendicitis or acute diarrhea. (See pp. 524 and 525, also pp. 528 and 529.)

The typical foods to be emphasized and those to be avoided in the treatment of diverticulitis and diverticulosis are the same as those in the bland diet on page 712.

65 Gm. Protein
2,600 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 245, Protein 65, Fat 150, Calories 2,590

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	100	10 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	60	1 serving (2 oz.)
Bacon	10	2 slices, crisp
Egg	100	2
Vegetables, 3% Vegetables, 6% Vegetables, 15%	300	3 servings
Fruit, 10%, juice	200	1 glass
Fruit, 15–20%	300	3 servings
Potato or rice	100	1 serving
Sugar or jelly	30	2 tablespoons
Dessert	100	1 serving

65 Gm. Protein
2,600 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Orange juice	½ glass	100
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices, crisp	10
Egg	1	50
Bread (toast)	1 slice	30
Butter	2 squares	20
Cream, 20%	¼ cup	60
Sugar or jelly	2 tablespoons	30
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Fruit juice	½ glass	100
Egg or substitute	1	50
Vegetable	1 serving	100
Bread	1 slice	30
Butter	4 squares	40
Milk	1 glass	200
Fruit	1 serving	100
DINNER		
Meat	1 serving	60
Potato or rice	1 serving	100
Vegetable	2 servings	200
Bread	1 slice	30
Butter	4 squares	40
Milk	1 glass	200
Fruit	1 serving	100
Dessert	1 serving	100

Food Allergy

Nature of Condition

Sensitization to certain foods

Object of Diet

To eliminate foods that cause sensitiveness, the while maintaining an adequate diet

Foods that in the majority of people cause no ill effects do produce in a few people who have real sensitivity to food a characteristic group of symptoms. The ingestion of the merest trace of whatever food they are sensitive to may produce in this small group of individuals who are hypersensitive to one or more foodstuffs any one of a number of conditions with menacing symptoms.

CONDITIONS THAT MAY RESULT FROM FOOD ALLERGY

1. Nasal allergy (seasonal and nonseasonal coryza)
2. Urticaria (hives)
3. Atopic dermatitis
4. Headaches of various types:
   Migraine, sick headaches, cyclic vomiting
5. Gastro-intestinal allergy:
   - Canker sores
   - Stomatitis
   - Distention
   - Nausea, vomiting
   - Diarrhea
   - Recurrent bilious attacks
6. Generalized pruritis or localized pruritis ani or vulvae
7. Bladder irritation
8. Ocular allergy
9. Angioneurotic edema
10. Bronchial asthma
11. Hay fever

Unlike other phases of nutrition, the diagnosis and the treatment of cases of food allergy cannot be sharply separated, for the specific allergic diagnosis is satisfactorily reached only by manipulation of the diet. The problem of reaching the correct diagnosis is complicated by the fact that food sensitivity is often multiple. Multiple food reactions are more apt to occur in cases of long-continued allergic manifestations. Sensitivity may spread to related foods; for instance, multiple cereal sensitivity (wheat, rye, barley, corn, oats and rice), multiple fruit sensitivity, legume or cabbage family sensitivity.

A biologic classification of foods, as listed on pages 554 and 555, may materially aid in the diagnostic efficiency due to the possible crossed or group relationship of allergic reactions. It may be that an individual, when shown to be sensitive to one member of the biologic group, might be sensitive to another closely related member even though the customary reaction for that member was negative.

FACTORS INFLUENCING FOOD ALLERGY

This chapter is concerned chiefly with food allergy. However, many allergic patients have multiple sensitivities and their food response must be appraised in relation to the total allergic load at the time of investigation. In view of this fact a few examples will be given of other common, coexisting allergic factors that may modify food allergy.

Specific food allergy may be present only in association with seasonal inhalant symptoms, as, for instance, during the ragweed season in hay fever. These cases of concomitant food sensitivity must be diagnosed during the season of symptoms. Greater relief of hay fever is obtained when coexisting food allergy is controlled. In some instances when food sensitivity is a minor factor, control of associated inhalant sensitivity may result in relief of allergic symptoms.

In certain cases of drug allergy, particularly aspirin sensitivity, there is often a widespread food allergy. The combined aspirin- and food-sensitive patient is usually a difficult problem to control. This may be due to the number of foods involved or possibly to continued exposure to coal-tar-containing products.

There are other precipitating factors that may modify food sensitivity and these should be mentioned and considered. In women, allergic manifestations are commonly accentuated immediately prior to and during the menstrual period. In fact, they may be limited to this time. In pregnancy, allergic disease may either be materially relieved or accentuated. The responsible mechanisms for these changes are not understood. There is often a change in the allergic status of women during the menopause.

Influenza, whooping cough, measles and some other infections are commonly associated with or followed by increased allergic symptoms.

TYPES OF FOOD ALLERGY BASED ON THE RESPONSE TO SPECIFIC AVOIDANCE

The cardinal principle in the treatment of food sensitivity is the avoidance of the causative agents, for, in accordance with the concept of cyclic food allergy as developed by Rinkel, the degree of sensitivity is gradually diminished if the specific mechanism is not stimulated for a prolonged period of time. Randolph has attempted to represent the changes occurring in masked food allergy in the chart on page 556 (Types of Food Allergy).

In the phase of masked sensitivity, the individual has low-grade, smoldering symptoms to a food, such as wheat, which is eaten at frequent intervals. Avoidance of this food for four days allows the patient to recover from the effects of the last feeding. Another feeding at this time commonly results in a diagnostic symptom response. The complete avoidance of the food for several months is usually associated with a decrease in the degree of sensitivity to the point that after three to six months it ordinarily may be replaced in the diet if done so in spaced rather than cumulative feedings. It may be assumed that a fixed degree of sensitivity exists if avoidance for two years fails to alter the degree of sensitivity.

Complete avoidance is the ideal way to treat food sensitivity, provided the patient does not have a too complicated problem, meaning too widespread involvement of the important foods of the diet at the time when first seen. If sensitivity to numerous common foods exists at the time of the initial visit, this suggests that the patient may readily become sensitized to substituted foods used in

BIOLOGIC CLASSIFICATION OF FOODS*

PLANTS

- **Grains**
  - Wheat
    - Flour
    - Graham flour
    - Patent flour
    - Gluten flour
    - Bran
    - Wheat germ
  - Rye
  - Barley
    - Malt
  - Corn
    - Cornstarch
    - Corn oil
    - Corn sugar
      - Corn sirup
      - Cerulose
      - Dextrose
      - Glucose
  - Oats
  - Rice
  - Wild rice
  - Sorghum
  - Cane
    - Cane sugar
    - Molasses
- **Spurge Family**
  - Tapioca
- **Arrowroot Family**
  - Arrowroot
- **Arum Family**
  - Taro
    - Poi
- **Buckwheat Family**
  - Buckwheat
  - Rhubarb
- **Potato Family**
  - Potato
- **Legumes**
  - Navy bean
  - Kidney bean
  - Lima bean
  - String bean
  - Soybean
    - Soybean oil
  - Lentil
  - Black-eyed pea
  - Pea
  - Peanut
    - Peanut oil
  - Licorice
  - Acacia
  - Senna
- **Mustard Family**
  - Mustard
  - Cabbage
  - Cauliflower
  - Broccoli
  - Brussels sprouts
  - Turnip
  - Rutabaga
  - Kale
  - Collard
  - Celery cabbage
  - Kohlrabi
  - Radish
  - Horseradish
  - Water cress
- **Gourd Family**
  - Pumpkin
  - Squash
  - Cucumber
  - Cantaloupe
  - Muskmelon
  - Honeydew
  - Persian melon
- **Parsley Family**
  - Parsley
  - Parsnip
  - Carrot
  - Celery
  - Celeriac
  - Caraway
  - Anise
  - Dill
  - Coriander
  - Fennel
- **Morning Glory Family**
  - Sweet potato
  - Yam
- **Sunflower Family**
  - Jerusalem artichoke
  - Sunflower seed oil
- **Pomegranate Family**
  - Pomegranate
- **Ebony Family**
  - Persimmon
- **Rose Family**
  - Raspberry
  - Blackberry
  - Loganberry
  - Youngberry
  - Dewberry
  - Strawberry
- **Banana Family**
  - Banana
- **Apple Family**
  - Apple
    - Cider
    - Vinegar
    - Apple pectin
  - Pear
- **Olive Family**
  - Green olive
  - Ripe olive
    - Olive oil
- **Heath Family**
  - Cranberry
  - Blueberry
- **Gooseberry Family**
  - Gooseberry
  - Currant
- **Honeysuckle Family**
  - Elderberry
- **Rue Family**
  - Orange
  - Grapefruit
  - Lemon
  - Lime
  - Tangerine
  - Kumquat
- **Pineapple Family**
  - Pineapple
- **Papaw Family**
  - Papaya
- **Grape Family**
  - Grape
    - Raisin
    - Cream of tartar
- **Myrtle Family**
  - Allspice
  - Cloves
  - Pimento
  - Paprika
  - Guava
- **Mint Family**
  - Mint
  - Peppermint
  - Spearmint
  - Thyme
- **Orchid Family**
  - Vanilla
- **Madder Family**
  - Coffee
- **Tea Family**
  - Tea
- **Pedalium Family**
  - Sesame oil
- **Mallow Family**
  - Okra (Gumbo)
  - Cottonseed oil
- **Stercula Family**
  - Cocoa
    - Chocolate
- **Birch Family**
  - Filbert
  - Hazelnut
  - Oil of birch (wintergreen)
- **Mulberry Family**
  - Mulberry
  - Fig
  - Hop
  - Breadfruit
- **Maple Family**
  - Maple sirup
    - Maple sugar
- **Palm Family**
  - Coconut
  - Date
  - Sago
- **Lecythis Family**
  - Brazil nut
- **Poppy Family**
  - Poppy seed
- **Walnut Family**
  - English walnut
  - Black walnut

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* The above biologic classification of foods is the summation of data from Vaughan, Ellis, Randolph and Chute (director of Shedd Aquarium).

- Tomato
- Eggplant
- Red pepper
  - Cayenne
- Green pepper
- Chili

Composite Family
- Leaf lettuce
- Head lettuce
- Endive
- Escarole
- Artichoke
- Dandelion
- Oyster plant
- Chicory

- Casaba
- Watermelon

Lily Family
- Asparagus
- Onion
- Garlic
- Leek
- Chive
- Aloes

Goosefoot Family
- Beet
  - Beet sugar
- Spinach
- Swiss chard

- Quince
  - Quince seed

Plum Family
- Plum
  - Prune
- Cherry
- Peach
- Apricot
- Nectarine
- Almond

Laurel Family
- Avocado
- Cinnamon
- Bay leaves

- Sage
- Marjoram
- Savory

Pepper Family
- Black pepper

Nutmeg Family
- Nutmeg

Ginger Family
- Ginger
- Turmeric
- Cardamon

Pine Family
- Juniper

- Butternut
- Hickory nut
- Pecan

Cashew Family
- Cashew
- Pistachio
- Mango

Beech Family
- Chestnut

Fungi
- Mushroom
- Yeast

Miscellaneous
- Honey

MEAT, FISH AND FOWL

Mollusks
- Abalone
- Mussel
- Oyster
- Scallop
- Clam

Crustaceans
- Crab
- Crayfish
- Lobster
- Shrimp
- Squid

Amphibians
- Frog

Fish
- Sturgeon
  - Caviar
- Anchovy
- Sardine
- Herring
- Smelt
- Trout
- Salmon
- Whitefish
- Chub
- Shad
- Eel
- Carp
- Sucker
- Buffalo
- Catfish
- Bullhead
- Pike
- Pickerel
- Muskellunge
- Mullet
- Barracuda
- Mackerel
- Tuna
- Pompano
- Bluefish
- Butterfish
- Harvestfish
- Swordfish
- Sunfish
- Bass
- Perch
- Snapper
- Croaker
- Weakfish
- Drum
- Scup
- Porgy
- Flounder
- Sole
- Halibut
- Rosefish
- Codfish
  - Scrod
- Haddock
- Hake
- Pollack
- Cusk

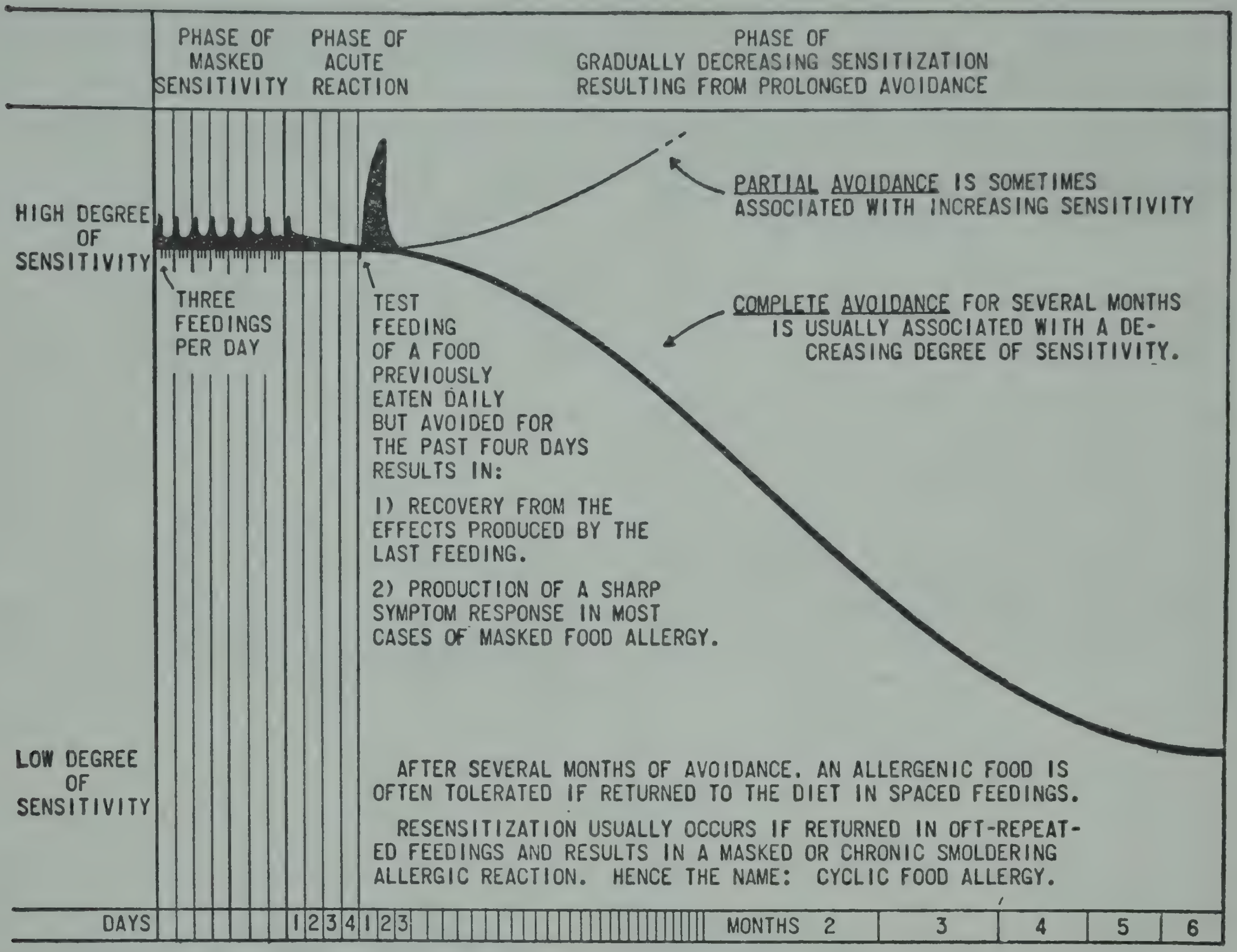
Reptiles
- Turtle

Birds
- Chicken
  - Chicken eggs
- Duck
  - Duck eggs
- Goose
  - Goose eggs
- Turkey
- Guinea hen
- Squab
- Pheasant
- Partridge
- Grouse

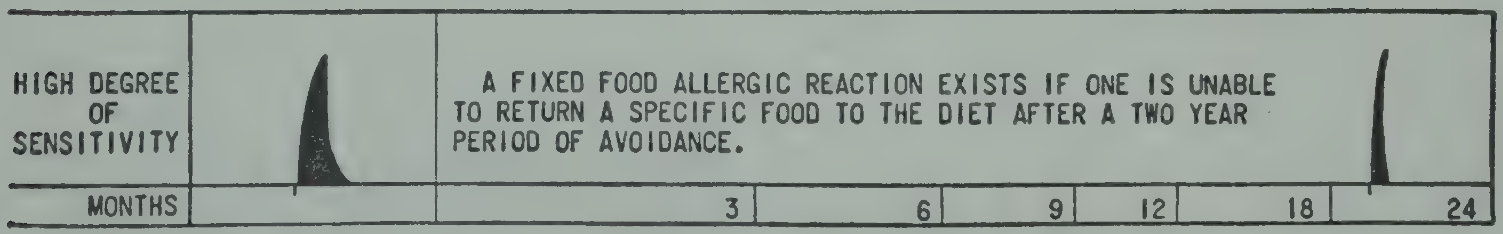
Mammals
- Beef
  - Veal
  - Cow's milk
  - Butter
  - Cheese
  - Gelatin
- Pork
  - Ham
  - Bacon
- Goat
  - Goat's milk
  - Cheese
- Mutton
  - Lamb
- Venison
- Horsemeat
- Rabbit
- Squirrel

TYPES OF FOOD ALLERGY
BASED ON THE RESPONSE TO SPECIFIC AVOIDANCE

I. CYCLIC FOOD ALLERGY (SENSITIVITY DECREASED BY AVOIDANCE)



II. FIXED FOOD ALLERGY (SENSITIVITY UNCHANGED BY AVOIDANCE)



oft-repeated doses. According to Rinkel, such cases should not be placed on highly restricted diets, for one substitute food after another may become incriminated and leave the patient with a progressively narrow diet. This type of difficult case is handled to the best advantage obviously by the avoidance of the most marked offenders. Sensitivity commonly may spread to involve other botanically related foods, so, when dealing with wheat sensitivity, for instance, the first obligation is to rotate the other cereal grains in the diet so as to avoid the oft-repeated use of any one of them. The rotation and the diversification of all foods is applicable to the entire diet. This is facilitated by using foods in simple form rather than mixed dishes containing multiple foods.

One of the fundamental reasons why the allergic concept of disease has failed to gain complete acceptance has been the inadequacy of present diagnostic methods and, to some extent, differences of opinion existing among allergists.

The diagnostic methods with regard to the inhalants are far more reliable and less cumbersome than are those with foods. Not only are the histories highly suggestive of the specific allergens involved, but cutaneous and intracutaneous skin tests are reasonably reliable diagnostic methods. According to numerous authors, neither statement is true in relation to food sensitivity.

DETERMINATION OF NATURE OF FOOD ALLERGY

In an attempt to determine the nature of food allergy four methods of approach may be considered:

1. A very careful history investigating food habits for observed food sensitization
2. Skin tests
3. Individual food tests
4. Elimination diets

History. The history is highly helpful in the detection of specific sensitivity to foods ingested at infrequent intervals. In fact, patients with this type of food allergy do not usually require professional help in the recognition of the offending food in their diet. For example, the patient who is sensitive to shrimp learns this quickly and avoids shrimp without a physician's counsel or advice. Sensitivity may exist to almost any food.

Foods most often responsible for food allergy:

Wheat or wheat products
Egg
Milk or milk products (butter, cream or cheese)
Corn

Other Foods Frequently at Fault:

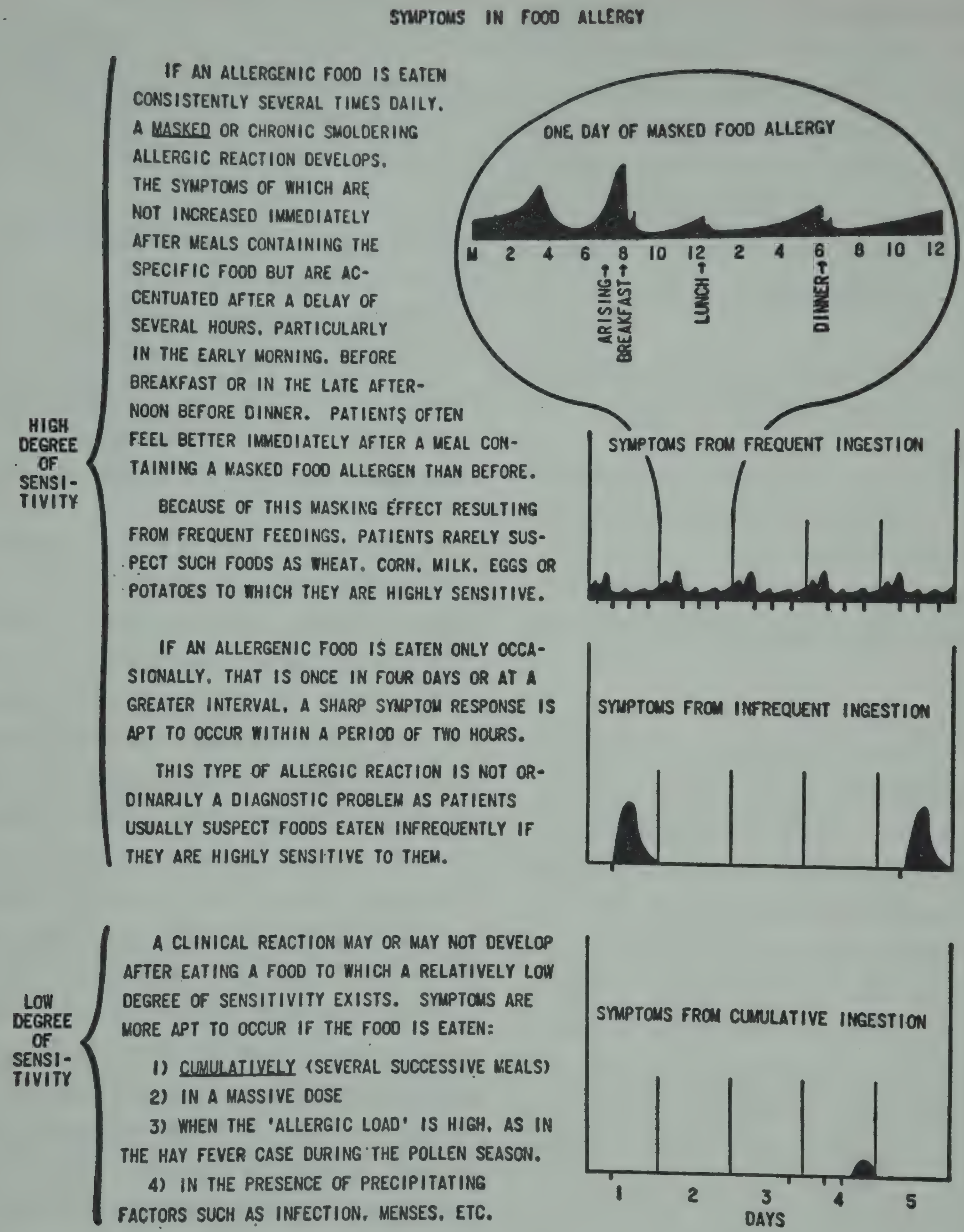
Pork
Potato
Beef
Orange
Chocolate
Tomato

Legumes:
Navy bean
Kidney bean
Lima bean
String bean
Soybean
Soybean oil
Lentil
Pea
Peanuts

Fish, especially shellfish, lobster, crab and shrimp
Lettuce
Cabbage
Cauliflower
Banana
Apple
Peach
Celery
Carrot
Grapefruit
Cantaloupe
Pepper
Nuts

So far as the detection of specific food allergies is concerned, the most detailed history gives neither specific nor complete diagnostic information, particularly when dealing with the masked or chronic smoldering allergic responses arising from the oft-repeated ingestion of such foods as wheat, eggs, milk, corn, potato, orange, beef, pork, coffee, lettuce, legumes, etc. The various phases of masked food allergy, as described by Rinkel, represent a major diagnostic problem as regards the recognition and the management of food sensitivity. As shown in the accompanying symptom chart, devised by Randolph, the patient is not usually able to detect sensitivity to a food eaten at frequent intervals because of the masking effect that is commonly produced.

Skin Tests: Skin-testing with food allergens either by the cutaneous or intracutaneous methods is of such dubious reliability that it is a serious question whether these procedures are indicated. Both false-positive and false-negative reactions occur with such consistency that elimination diets based on skin-test results alone are most misleading to both physician and patient. Although the fallibility of skin-testing with foods has



SYMPTOMS IN FOOD ALLERGY

IF AN ALLERGENIC FOOD IS EATEN CONSISTENTLY SEVERAL TIMES DAILY, A MASKED OR CHRONIC SMOLDERING ALLERGIC REACTION DEVELOPS, THE SYMPTOMS OF WHICH ARE NOT INCREASED IMMEDIATELY AFTER MEALS CONTAINING THE SPECIFIC FOOD BUT ARE ACCENTUATED AFTER A DELAY OF SEVERAL HOURS, PARTICULARLY IN THE EARLY MORNING, BEFORE BREAKFAST OR IN THE LATE AFTERNOON BEFORE DINNER. PATIENTS OFTEN FEEL BETTER IMMEDIATELY AFTER A MEAL CONTAINING A MASKED FOOD ALLERGEN THAN BEFORE.

BECAUSE OF THIS MASKING EFFECT RESULTING FROM FREQUENT FEEDINGS, PATIENTS RARELY SUSPECT SUCH FOODS AS WHEAT, CORN, MILK, EGGS OR POTATOES TO WHICH THEY ARE HIGHLY SENSITIVE.

IF AN ALLERGENIC FOOD IS EATEN ONLY OCCASIONALLY, THAT IS ONCE IN FOUR DAYS OR AT A GREATER INTERVAL, A SHARP SYMPTOM RESPONSE IS APT TO OCCUR WITHIN A PERIOD OF TWO HOURS.

THIS TYPE OF ALLERGIC REACTION IS NOT ORDINARILY A DIAGNOSTIC PROBLEM AS PATIENTS USUALLY SUSPECT FOODS EATEN INFREQUENTLY IF THEY ARE HIGHLY SENSITIVE TO THEM.

A CLINICAL REACTION MAY OR MAY NOT DEVELOP AFTER EATING A FOOD TO WHICH A RELATIVELY LOW DEGREE OF SENSITIVITY EXISTS. SYMPTOMS ARE MORE APT TO OCCUR IF THE FOOD IS EATEN:

1) CUMULATIVELY (SEVERAL SUCCESSIVE MEALS)
2) IN A MASSIVE DOSE
3) WHEN THE 'ALLERGIC LOAD' IS HIGH, AS IN THE HAY FEVER CASE DURING THE POLLEN SEASON.
4) IN THE PRESENCE OF PRECIPITATING FACTORS SUCH AS INFECTION, MENSES, ETC.

HIGH DEGREE OF SENSITIVITY
ONE DAY OF MASKED FOOD ALLERGY
M 2 4 6 8 10 12 2 4 6 8 10 12
ARISING→
BREAKFAST→
LUNCH→
DINNER→
SYMPTOMS FROM FREQUENT INGESTION
SYMPTOMS FROM INFREQUENT INGESTION
LOW DEGREE OF SENSITIVITY
SYMPTOMS FROM CUMULATIVE INGESTION
1 2 3 4 5
DAYS

been emphasized repeatedly, skin-test negative diets remain a widely used method of diagnosing food sensitivity.

The removal of basic foods from the diet is a serious matter and should only be advised if clearly indicated on unmistakable clinical evidence and then performed as a part of the treatment of food allergy based on a sound understanding of the various changes in tolerance that occur with regard to the duration of specific avoidance. The recognition of specific food allergy is still a clinical problem, as it was prior to the advent of skin-testing technic.

Individual Food Tests. The chief practical value of the individual food test is the ability to detect current specific tolerance or intolerance to the foods which most commonly produce masked cumulative or latent reactions. The technic may be used to advantage in supplementing the basic type of elimination diets either by testing major food suspects prior to the application of a comprehensive elimination plan or by check-ing the questionable food following such a procedure.

Years ago, Widal reported that the leukocyte count was greatly decreased in acute allergic diseases. Vaughan employed this principle as a diagnostic aid to determine the presence of food allergy in 1934. On this basis, he elaborated a diagnostic procedure which he called the leukopenic index, that is, relationship between fasting and postprandial leukocyte count.

Rinkel has reported the results of clinical observations following the trial feeding of individual foods in 1933. Rinkel subsequently included preingestion and postingestion total leukocyte determinations as a part of his technic but continued to stress the diagnostic significance of clinical reactions developed during and following experimental feeding. In view of the complicated nature of this problem and the necessity for an individualized approach, the individual feeding test as advocated by Rinkel and Randolph seems to warrant considerable merit. This test performed with a food previously eaten at frequent intervals but avoided four days prior to reintroduction to the diet, under experimental conditions, frequently results in a sharp diagnostic clinical response.

Any one or more of the various types of allergic clinical response symptoms may occur from individual food tests:

(a) Nose, includes sneezing, watering, itching or stuffiness.

(b) Chest, includes clearing of throat, coughing or wheezing.

(c) Abdomen, includes bloating, cramps, nausea, vomiting, diarrhea, etc.

(d) Headache, including marked fatigue to splitting headache.

(e) Skin, includes itching, redness, hives or eczema.

The technic consists of the preliminary preparation of the patient by the complete avoidance of the food in question for four days prior to testing, and testing on the fifth day. All food, medications and tobacco are omitted for at least five hours prior to the test. After resting in the sitting position for thirty minutes, two total leukocyte counts are made to establish a base line. From an average to a large serving of the food to be tested is eaten within a period of five minutes, and total leukocyte determinations are made at intervals of twenty, forty and sixty minutes after completion of the test meal. If clinical symptoms have not been produced within the first hour after test feeding, a second serving is fed and the patient is kept under clinical observation for another thirty minutes. In studying the results of this diagnostic measure in cases of unknown food sensitivity, there has been a high degree of correlation between the findings of a postprandial leukocytosis and the current evidence of specific clinical tolerance on the one hand and a postingestion leukopenia with evidence of clinical intolerance following the test, or cumulative feeding, on the other hand.

Randolph has shown recently that there is a high degree of correlation between induced or aggravated clinical symptoms and a 10 per cent or greater degree of leukopenia occurring in any of the postprandial leukocyte counts. As a result of such tests with several of the major foods, one is then able to include at least a few compatible major foods in the initial diagnostic elimination diet, eliminating others on the basis of probability and the specific food-intake history of the individual patient. This approach also gives one an indication of whether a patient has a wide or narrow base of sensitivity. If numerous major foods are incriminated by this test, considering both clinical and leukocyte response, one is not justified in prescribing a highly restricted elimination diet because of the ease with which sensitivity may spread to substitute foods.

Elimination Diets. Perhaps the most generally available way of diagnosing food allergy is by means of elimination diets. Many dietary methods have been employed in an effort to detect the food responsible for the allergy. Bulkley and von Leeuwen used rice and tea diets; Salomon, a protein-free diet; Vaughan, a trial diet composed of foods which were found to produce allergy infrequently. However, Rowe deserves credit for first systematizing diets that may be used in a practical manner. Rowe carefully planned a series of "elimination diets" not to include any foods to which patients were frequently allergic.

The purpose of any diagnostic plan is to place the patient upon a very simple diet, omitting all foods except a few that are generally the least likely to produce symptoms. It is a trial-and-error method. If one can find a basic test diet that keeps the individual symptom-free, additional foods are added one at a time until the offending food is found.

This process is often a tedious and discouraging procedure and too frequently there is difficulty in obtaining the patient's full co-operation.

It is practically impossible to devise a test diet that will be correct for the great majority of sufferers from any of the allergic diseases. The entire field of food allergy is in its infancy and improved diagnostic measures can be expected.

Attention should be paid both to satisfying the nutritional needs of each patient and to palatability in order to secure the full co-operation of the patient.

IMPORTANT FACTORS IN DIETARY TREATMENT OF FOOD ALLERGY

1. All offending foods should be excluded from the diet.
2. The diet selected for trial should be taken for from four days to two to three weeks.
3. The prescribed diet should be adhered to absolutely.
4. Diets continued over a long period of time must be planned to maintain nutrition.
5. The diet should be supplemented with such minerals and vitamin concentrates as are necessary to make it adequate.

These factors need further discussion.

All Offending Foods Should Be Excluded from the Diet. The first trial diet should be planned to exclude all the known offending foods from the diet. Even the most minute amount of a specific allergy may cause severe symptoms or may merely persist in a mild manner indefinitely. The chronic allergic manifestations may be perpetuated by continuing to eat small amounts of offending foods.

The Diet Selected for Trial Should Be Taken for from Four Days to Two to Three Weeks. Many times the reacting bodies from the food to which the patient shows allergic symptoms disappear very slowly from the tissues. For this reason the trial diet selected must be continued over a fair period of time before another elimination diet is tried.

The Prescribed Diet Should Be Adhered to Absolutely. No food other than that listed on the prescribed diet must be eaten. Therefore, it is imperative that instructions be followed exactly and that no trace of the excluded food be permitted in the diet. Obviously, the tasting of a forbidden food is not permissible and scrupulously clean kitchen and dining utensils must be used. It should be remembered that the active principle in foods is water-soluble. In cases of extreme sensitivity, symptoms have been precipitated by the inhalation of steam from cooking an allergenic food. A wheat-sensitive patient, for instance, may have a reproduction of symptoms by eating the meat of fowl cooked with a wheat-containing stuffing or by eating soup which was cooked with noodles but from which the noodles had been drained.

Diets Continued Over a Long Period of Time Must Be Planned to Maintain Nutrition. Whenever a diet is to be followed for more than a week, emphasis must be placed upon the importance of planning the diet with the proper amount of protein, calories, vitamins and minerals. It is especially important to keep the caloric intake high enough by the use of oils, sugar and starches, so that the patient may be protected against undesirable weight loss.

Probably greater emphasis should be placed on the protein intake, especially in the case of those patients who are sensitive to milk, eggs or fish. It is necessary for such patients to take more liberal amounts of meat.

The Diet Should Be Supplemented with Such Minerals and Vitamin Concentrates as Are Necessary to Make the Diet Adequate in All the Food Essentials. In the milkfree diet, there is usually a slight calcium deficiency. There are various calcium preparations on the market that may be used to supplement the diet to take care of this deficiency.

Whenever the patient is unable to take liberal amounts of fruits and vegetables, vitamin concentrates should supplement the particular vitamin deficiency.

As soon as a diet is found to relieve the symptoms it should be increased by gradually adding, one at a time, other foods that the patient is able to tolerate without allergic manifestations. This is most important in order to give greater variety in food selection and to ensure the patient against any food deficiency.

DIRECTIONS FOR APPLICATION OF THE ELIMINATION DIETS

The author has outlined a suggested distribution of food for each of the diets. The protein and caloric values of the elimination-diet menus vary. The actual quantities of any of the foods allowed in each diet may be increased or decreased in order to regulate the protein or the calories to meet the individual needs. The choice of the diet to be first tried depends on the patient's history of food sensitiveness and the doctor's judgment in the particular case.

The use of basic elimination diets is far superior to the avoidance of foods giving a positive skin test. There is the additional advantage that these diets are more readily available than individual food tests. However, the fact remains that specific food sensitivity is usually multiple, that it commonly is due to or is readily induced by cumulative ingestion of one or more of the foods permitted on such diets. The author has considered four types of elimination diets:

1. Rowe's cereal-milk-and-egg-free elimination diet.

2. Rowe's fruit-cereal-milk-and-egg-free elimination diet.

3. Ralston's wheat-corn-oats-milk-egg-potato-and-legume-free elimination diet.

4. Milk alone.

These four elimination diets seem to the author to be the most workable.

One of the most widely used is Diet 1, Rowe's cereal-milk-and-egg-free elimination diet. Randolph points out that this diet is not entirely cornfree in its present form. Those foods that may have corn are indicated with an asterisk. This diet contains potatoes, tomatoes, lettuce and fruits, to which many patients are either sensitive or to which sensitivity may be easily acquired by oft-repeated feedings.

Some food-sensitive patients are allergic to several fruits and some apparently are allergic to all fruits. A few individuals can take cooked but not uncooked fruits. On rare occasions in patients with fruit allergy, definite symptoms develop, especially in the gastrointestinal tract when cevitamic acid is taken. This occasional allergy to the synthetic vitamin C in fruit-sensitive patients may occur. If this can be proved, then it is imperative that vegetables rich in vitamin C be eaten to prevent avitaminosis.

Diet 2, the Rowe fruit-cereal-milk-and-egg-free elimination diet, is outlined to meet this problem.

The Ralston elimination diet, Diet 3, although free of wheat, corn, oats, milk, egg, potato, tomatoes and legumes, contains an abundance of rye, which is so similar allergenically to wheat that it may fail to bring the expected degree of relief in the wheat-sensitive patient or it may sensitize the individual to rye. This diet is cornfree and, as mentioned in the list of corn sources, page 575, corn elimination should exclude all foods containing corn oil, cornstarch or corn sugar (dextrose, glucose and cellulose).

Milk Diet 4 may be used if the patient gives no indication of milk sensitization. From two to three quarts a day should be used; cane sugar and tapioca may be included. In such case, if symptoms are relieved by the exclusive use of milk, other foods may be added gradually, the while watching for the effect of such additions.

In general application, if a cereal, milk or egg sensitivity is suspected, the patient should be placed on Diet 1. If, in addition, the patient has a possible fruit sensitivity, Diet 2 should be used. If the patient has no evidence of fruit sensitivity, but cereals, milk, egg, potatoes, tomatoes or legumes are suspected, Diet 3 should be used.

Pages 574 and 575 show foods containing wheat, egg, milk and corn.

The initial diagnostic elimination diet may result in complete or partial relief of allergic symptoms, or it may accentuate symptoms if it happens to include frequent doses of a potent offender. A period of from four days to two or three weeks should be sufficient trial for any one of the elimination diets chosen before going on to another. One should not be discouraged by failure to respond to the initial diet. If the diet first selected does not relieve symptoms, one must continue with others by the trial-and-error method. Repeated diet trials are sometimes necessary with changes as the result of observations recorded on the food diary and symptom chart.

The object of the diagnostic elimination diet is to relieve current allergic symptoms. When this end is accomplished, certain eliminated foods will be returned to the diet in cumulative doses to determine whether or not they may be tolerated. Rowe states that in order to ascertain the allergenicity of each food, from five to seven days should be allowed to elapse between additions. One or two vegetables or fruits or meats and starches are gradually added. Any foods which reproduce symptoms are immediately excluded. This will terminate the diagnostic phase of elimination diet control.

The diet finally decided upon—which may be called the therapeutic diet—is not to be regarded as a life sentence, for various degrees of tolerance are usually obtained by the prolonged avoidance of an offending food. After several weeks or months an avoided food may be reintroduced into the diet. This should be done under supervision in an orderly and regulated fashion or resensitization is apt to occur. Although complete tolerance is rarely, if ever, regained, such a person ordinarily is able eventually to eat such food in moderation, provided oft-repeated and massive doses are avoided.

It is desirable to make the therapeutic diet as diversified as possible within its limitations, as sensitization to various substituted foods may occur if these are taken in oft-repeated doses. A given substitute cereal should preferably not be used exclusively. The various cereal substitutes, fruits, vegetables, meats, etc., should be rotated. As many foods as possible should be included in the diet and any one food in successive meals should be avoided. The diet which is finally made up for the patient must, of course, be properly balanced so as to be adequate in all essential requirements.

ELIMINATION DIETS

	DIET 1 Cereal-Milk-Egg-Free Elimination Diet (Rowe)	DIET 2 Fruit-Cereal-Milk-Egg-Free Elimination Diet (Rowe)	DIET 3 Wheat-Corn-Oats-Milk-Egg-Potato-Legume-Free Elimination Diet (Ralston)	DIET 4 Milk alone for test period
Cereal			*Rice,* white, brown, wild, puffed, flour	2–3 quarts a day May include cane sugar and tapioca
Starches	Cane or beet sugar	Cane or beet sugar	Cane sugars (white or brown) Cane sugar sirup Cane sugar and water candies	
Bread	Lima-bean potato bread Soybean Lima-bean bread Soybean potato tapioca bread	Lima-bean potato bread Soybean Lima-bean bread Soybean potato tapioca bread	Ry-Krisp	
Meat or fish	Lamb Beef Chicken (no hens) *Bacon Liver (calves beef lamb)	Lamb Beef Chicken (no hens) *Bacon	Lamb	
Fats	Sesame oil Soybean oil	Sesame oil Soybean oil	Lamb fat drippings, pure Olive oil, pure Mineral oil	
Vegetables	White potatoes Lettuce Spinach Chard Carrots Beets Sweet potatoes or yams Artichokes Tomatoes Squash Asparagus Peas String beans Lima beans	White potatoes Sweet potatoes or yams Tomatoes† Spinach† Chard Carrots Beets Artichokes Squash Asparagus Peas String beans Lima beans	Beets Beet greens Spinach Sweet potatoes	

Fruit, Fruit juices, *Jams	Lemon Grapefruit Pears Pineapple Peaches Apricots Prunes		Apricots Cherries Peaches Cranberries Prunes *Juices:* Apricot Cranberry Prune	
Miscellaneous	Tapioca Salt Sesame oil Soybean oil Sesame spread Gelatin, plain Lime-, lemon- or pineapple-flavored gelatin Maple sirup or sirup made with cane sugar flavored with maple *White vinegar Vanilla extract Baking soda Cream of tartar Lemon extract *Royal Baking Powder	Tapioca Salt Soybean oil Sesame oil Gelatin, plain Sirup made with cane sugar Acetic acid (6%) vinegar Vanilla extract Baking soda Cream of tartar *Royal Baking Powder	Ripe olives, pure Baking soda Salt Vanilla extract, pure Tapioca, pure Cream of tartar Gelatin, pure and unflavored Citric acid (buy from drugstore)	
Beverage	Tea Maté (Brazilian tea)	Maté (Brazilian tea) Tea	Tea	

* Foods may contain corn. Swift's Premium and Armour's Star bacon are cornfree. Commercially canned fruits, fruit juices and commercial jellies, jams or preserves usually contain corn sirup and are therefore forbidden if elimination diets are to be cornfree.

† Foods should be eliminated if allergy thereto is suggested by history or individual food test

Diet 1

Cereal-Milk-Egg-Free Elimination Diet (Rowe)

SUGGESTED MENU

BREAKFAST

Beverage:

- (*a*) Fresh or canned* grapefruit juice served with sugar.
- (*b*) Pineapple, apricot, peach or prune juice, served singly or mixed with grapefruit juice.
- (*c*) Tomato juice (canned and unspiced).

Cereal Substitute:

- (*a*) Tapioca cooked with water or fruit juice and puréed apricots, peaches, prunes or pineapple and sugar, served hot with juice of the fruit if desired. (1)
- (*b*) Tapioca cooked in water, sweetened with sugar and flavored with lemon juice and grated lemon rind, or cooked with caramelized sugar, brown sugar or maple sirup. (2)
- (*c*) If tapioca is unavailable (1) soy-potato pudding (15) or (2) white or sweet potato may be served. (If tapioca and potato become unavailable, Elimination Diets 1 and 2 may have to be used even though allergy to rice, corn or rye is suspected.)

Meat:

- (*a*) Bacon*
- (*b*) Lamb chops, patties or tongue (unspiced). (3)
- (*c*) Beefsteak, beef patties or tongue (unspiced).
- (*d*) Calves', beef or lamb liver and bacon.

Bread:

- (*a*) Soy-potato or soy-Lima-potato bread. (4) (6)
- (*b*) Soy-potato muffins. (4)
- (*c*) Soy crackers. (13)
- (*d*) Pancakes or waffles made of soy and potato flours, served with maple sirup or sugar. (7)

Butter Substitute:

Sesame or soy oil with salt, bacon* grease, jams,* preserves* or jellies of specified fruits, or maple sirup may be used on bread.

*Jams or Preserves:**

- (*a*) Jams made of pears, pineapple, peaches, apricots and prunes, singly or in combination. (38, 39)
- (*b*) Lemon, grapefruit or carrot marmalade. (40, 41)

Fruit:

- (*a*) Fresh, cooked or canned* grapefruit, pears, pineapple, peaches or apricots. Fresh peeled pears, peaches and apricots may be eaten raw if allowed by the physician.
- (*b*) Cooked dried prunes. Lemon juice and sugar may be added as desired. No dried apricots, pears or peaches unless allowed by physician.

Numbers in parentheses refer to Rowe recipes in appendix, pages 718 to 725.

* Foods may contain corn. Swift's Premium and Armour's Star bacon are cornfree. Commercially canned fruits, fruit juices and commercial jellies, jams or preserves usually contain corn sirup and are therefore forbidden if the elimination diets are to be cornfree.

LUNCH OR DINNER

Soup:

(*a*) Broth made of lamb, beef or chicken (no hens) served clear with tapioca or cooked with vegetables as previously listed. (No pepper or spices, no canned soups and no soups away from home.)

(*b*) Lima-bean or split-pea soup, plain, salted, flavored with bacon. (8) (No milk, butter or any other food to be added.)

(*c*) Tomato soup with soybean. (9)

Salad:

Any combination of vegetables or fruits listed in this diet, dressing only of sesame or soy oil, white vinegar* or lemon juice, salt and sugar. (43, 44) (Variations: [1] Lime- or lemon-flavored gelatin with grated raw carrots or crushed pineapple. [2] Cooked sliced beets pickled in white vinegar,* seasoned with salt and sugar.)

Meat:

(*a*) Lamb and beef—chops, steak, tongue or liver, ground plain meat, roast (hot or cold)—cooked with salt in their own fats or with specified oil. No pepper, condiments or sauces. Gravies thickened with specified flour. (Garnish lamb chops and dried chicken with broiled pineapple, apricots or prunes.) (45)

(*b*) Chicken (no hens). Roasted, fried, broiled or stewed.
(Use prescribed flours and oil.)

Vegetables:

(*a*) Any of those listed in this diet, cooked with salt, without pepper and served with prescribed oil.

(*b*) White or sweet potato or yam baked, boiled or fried in prescribed oils. Prescribed oil and salt may be used.

(*c*) Sweet potato or yam candied with brown sugar or maple sirup. Prescribed oil may be added if desired.

Bread:

Choice of those suggested for breakfast.

Butter Substitute:

As suggested for breakfast.

*Jams, Preserves or Jellies:**

Choice of those suggested for breakfast.

Desserts:

(*a*) Fruit as suggested for breakfast.

(*b*) Tapioca fruit pudding. (1)

(*c*) Soy-potato pudding. (15)

(*d*) Lemon-, lime- or pineapple-flavored gelatin, plain, whipped or with fruit added.

(*e*) Pears baked with brown sugar. (46)

(*f*) Lemon, pineapple or apricot water-ice made with juice, sugar and water, with or without gelatin. (47–52) (Commercial sherbets and ices contain milk, egg or other forbidden foods.)

(Soybean, Lima-bean, potato cookies, cakes or cup cakes or soy cookies as desired.) (10–18)

Beverage:

Choice of those suggested for breakfast.

Candies:

(*a*) Candied grapefruit or lemon peel or glacéed pineapple. (53, 54) (Made at home.)

(*b*) Dried prunes pitted and stuffed with lemon-flavored fondant. (Made at home.)

(*c*) Pure maple-sugar candy.

(*d*) Plain fondant may be made at home and flavored with the fruits on this diet. (19–21)

Between meals, if desired, the patient may have lime, lemon or pineapple gelatin, tapioca fruit pudding, canned fruits,* cookies, cakes, cupcakes or candy made according to recipes in these diets.

Numbers in parentheses refer to Rowe recipes in appendix, pages 718 to 725.

* Foods may contain corn.

Diet 1

Cereal-Milk-Egg-Free Elimination Diet

A Suggested Menu for One Day

70 Gm. Protein
2,150 Calories

		Gm.
BREAKFAST		
Grapefruit	1 serving	100
*Bacon	2 slices	20
Peach or apricot preserves	1 large tablespoon	25
Lima-bean and potato muffin†	2 small muffins	
Sugar (cane)	1 tablespoon	15
Beverage—coffee or tea		
LUNCHEON		
Lamb chop (trimmed)	3 medium	90
Baked potato	1 medium	100
Salad:		
Lettuce	1 small serving	25
Tomato	1 serving	100
French dressing (olive oil and lemon juice)	3 tablespoons	45
Lima-bean and potato muffin	2 small muffins	
Pear	1 serving	100
DINNER		
Pineapple cocktail	1 serving	100
Roast beef	1 large serving	90
Sweet potato	1 serving	100
Carrot	1 serving	100
Salad:		
Lettuce	1 small serving	25
Tomato	1 serving	100
French dressing	3 tablespoons	45
Lima-bean and potato muffin	2 small muffins	
Prune	1 serving	100

* Food may contain corn.

† Recipe for muffins, cookies and cupcakes, p. 718.

Diet 2

Fruit-Cereal-Milk-Egg-Free Elimination Diet

A Suggested Menu for One Day

70 Gm. Protein
2,180 Calories

BREAKFAST		*Gm.*
Tomato juice	1 serving	100
Tapioca (fruit-free)†	1 serving	100
*Bacon	2 slices	20
Lima-bean and potato muffin†	2 small muffins	
Sirup (cane sugar)	1 tablespoon	15
Beverage—tea		
LUNCHEON		
Chicken	½ broiler	75
Sweet potato	1 medium	100
Salad:		
Carrots	1 small serving	50
Tomato	1 serving	100
French dressing	3 tablespoons	100
Lima-bean and potato muffin	2 small muffins	
Soy cookies†	2	
DINNER		
Chicken broth	1 serving	100
Roast lamb	1 serving (3 oz.)	90
Baked potato	1 medium	100
Beets	1 serving	100
Salad:		
Artichoke	1 serving	100
Asparagus	1 small serving	50
French dressing	3 tablespoons	45
Soybean Lima-bean bread†	1 slice	
Fruit-free tapioca	1 serving	100

† Recipe for muffins, cookies, bread and fruit-free tapioca, pp. 718 to 725.
* Food may contain corn.

Diet 2

Fruit-Cereal-Milk-Egg-Free Elimination Diet (Rowe)

SUGGESTED MENU

BREAKFAST

Beverage:

Tea or Maté (Brazilian tea) with sugar.

Carrot juice (canned) or pressed from raw carrots (brought to a boil and cooled). (Omit if not desired.)

Cereal Substitute:

(*a*) Tapioca (instant or pearl) cooked with water and granulated or caramelized sugar. (2)

(*b*) Potato starch pudding made with potato starch cooked with water and sugar and flavored with caramelized sugar.

(*c*) Soy-potato starch pudding flavored with caramel and no fruits. (8-f)

(*d*) Pancakes or waffles made of soybean and potato starch flours, served with cane sugar sirup. (7)

Meat:

(*a*) Bacon.*

(*b*) Lamb or beef—chops, steaks, patties or tongue (unspiced).

(*c*) Lamb, calves' or beef liver and bacon.

Bread:

(*a*) Bread made of any combination of soybean, Lima-bean and potato-starch flours. (4)

(*b*) Muffins made of above flours. (6)

Butter Substitute:

Sesame or soybean oil with salt, bacon grease* or maple sirup may be used on bread.

*Jams or Preserves:**

Carrot preserves (made without lemon juice) or cane sugar sirup. (42)

Numbers in parentheses refer to Rowe recipes in appendix, pages 718 to 725.

* Foods may contain corn.

LUNCH OR DINNER

Soup:

(*a*) Broth made of lamb, beef or chicken (no hens), served clear with tapioca or cooked with the vegetables listed. (No pepper or spices, no canned soups.)

(*b*) Lima-bean or split-pea purée, flavored with bacon.* (8)

Salad:

(*a*) Any combination of the cooked vegetables listed in this diet. Dressing may be made of soybean or sesame oil, salt and a little sugar.

(*b*) Molded salad using plain gelatin and vegetables previously listed. Oil dressing as in (*a*).

Meat:

(*a*) Lamb and beef—chops, steak, ground plain meat, roast (hot or cold) cooked with salt in their own fats or with specified oil. No pepper, condiments or sauces. Gravies thickened with potato starch or soybean flour.

(*b*) Beef, lamb or calves' tongue and liver cooked as above.

(*c*) Chicken (no hens) may be roasted, fried, broiled or fricasseed. Sesame or soybean oil and salt may be used. Thicken gravy with potato starch or soybean flour.

Vegetables:

(*a*) Any of those listed in this diet, cooked without pepper and served with sesame or soybean oil and salted to taste.

(*b*) White or sweet potato or yam, baked, boiled or fried in above oils.

(*c*) Sweet potato or yam candied with brown or white sugar and soybean oil if desired.

Bread:

Choice of those suggested for breakfast.

Butter Substitute:

As suggested for breakfast.

*Jams or Preserves:**

As at breakfast.

Dessert:

(*a*) Tapioca cooked as at breakfast.

(*b*) Potato-starch or soy-potato pudding (see breakfast menu).

(*c*) Cookies, cake or cupcakes made of any combination of soy, Lima and potato-starch flours and tapioca. (10–12, 14)

Beverage:

Tea or Maté.

Numbers in parentheses refer to Rowe recipes in appendix, pages 718 to 725.

* Foods may contain corn.

Diet 3

Wheat-Corn-Oats-Milk-Egg-Potato-Legume-Free Elimination Diet (Ralston)*

FOODS YOU MAY HAVE

Eat no foods not listed below. Eat no mixtures of foods, no canned or processed foods unless included in the list below or unless you are sure all the ingredients are included in this list.

BEVERAGE—*Tea* (only pure cane sugar may be added)

BREAD—*Ry-Krisp*

CEREAL—*Rice;* white, brown, wild, puffed, flour

FATS—*Lamb fat drippings,* pure; *Olive oil,* pure; *Mineral oil*

FRUITS—All must be thoroughly cooked; nothing added but pure cane sugar
Apricots
Cherries
Peaches
{Dried, fresh, frozen, commercially canned, if label reads "Water-packed" or "Unsweetened"; home-canned if only cane sugar added
Cranberries—Fresh frozen, dried or commercially canned; sauce or jelly
Prunes—Dried

FRUIT JUICES—
Apricot—Homemade if only cane sugar added
Cranberry—Homemade if only cane sugar added; commercially canned
Prune—Homemade if only cane sugar added, or commercially canned if label reads "Unsweetened"

MEAT—Lamb

MISCELLANEOUS—
Ripe olives (pure)
Baking soda
Salt
Vanilla extract (pure)
Tapioca (pure)
Cream of tartar
Gelatin (pure and unflavored)
Citric acid (buy from drugstore)

SWEETS—
Cane sugars (white or brown) *Cane sugar sirups* (homemade)
Cane sugar and water candies (pure, homemade)
Jams and preserves (homemade from allowed fruits and pure cane sugar)

VEGETABLES—All must be thoroughly cooked. Seasoned only with salt and allowed fats
Beets—Fresh, frozen, dried or home-canned if only salt added
Beet Greens—Fresh
Spinach—Fresh, frozen, commercially canned or home-canned if only salt added
Sweet Potatoes—Fresh, frozen, dried or home-canned if only salt or cane sugar added

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* See Ralston Restricted Diet Recipes in appendix, pages 726 to 729.

Diet 3

Wheat-Corn-Oats-Milk-Egg-Potato-Legume-Free Elimination Diet (Ralston)*

DAY'S MEAL-PLANNING GUIDE

From meal to meal and from day to day have as great a variety of foods as the following choices allow.

BREAKFAST—Choose at least one food from each of the following groups:

GROUP	FOODS
I **Fruits**	Any allowed ***fruit*** Any allowed ***fruit juice***
II **Cereals**	***Boiled rice***—brown or white, cooked with extra water to a thin consistency or served with apricot juice* or thickened prune juice;* cooked with fruit* ***Puffed rice,*** served with apricot juice* or thickened prune juice* ***Rice griddle cakes**** / ***Rice Waffles**** — served with pure sugarsirup,* sweet spread* or cranberry jelly
III ***Breads***	***Plain Ry-Krisp*** with sweet spread* ***Toasted Ry-Krisp**** ***Sugar-toasted Ry-Krisp****
IV ***Beverage***	***Tea***

BETWEEN-MEAL SUGGESTIONS

Any allowed fruit juice
Any allowed cooked fruit
Ry-Krisp—plain, toasted,* sugar-toasted*
Rice cookies*

Choose from each of the following groups at least the number of foods indicated for the meals as listed (no limitation on number or size of servings):

GROUP	LUNCH OR SUPPER	DINNER	FOODS
I **Fruit juices**	⇩	⇩ Choose 1	Any allowed ***fruit juice***
II **Meats**	Choose 1	Choose 1	***Roast lamb***—shoulder or leg ***Pan-broiled lamb chops***—loin, rib or shoulder ***Lamb pilaf**** ***Pan-broiled lamb patties**** (homemade with only salt added) ***Pan-broiled lamb liver slices**** ***Lamb loaf**** ***Lamb shank**** ***Lamb stew**** ***Sandwiches***—roast-lamb slices and Ry-Krisp lamb-loaf slices and Ry-Krisp
III **Vegetables**	Choose 1 or more	Choose 2 or more	***Beets***—boiled, Harvard,* pickled,* salad* ***Beet greens***—hot ***Rice,*** boiled—brown, white, wild ***Spinach***—hot, salad* ***Sweet potatoes***—boiled, baked, roasted, mashed, glazed,* balls,* salad* Use only salt and lamb drippings or olive oil to season those vegetables for which no recipe is given
IV **Relishes**	If desired	If desired	***Ripe olives*** ***Cranberry jelly***
V **Breads**	Choose 1	Choose 1	***Rice griddle cakes**** ***Toasted Ry-Krisp**** ***Ry-Krisp*** with sweet spread*
VI **Beverage**	If desired	If desired	***Tea,*** hot or iced
VII **Desserts**	Choose 1	Choose 1	Any allowed cooked ***fruit*** ***Fruited gelatin**** ***Fruit Betty**** ***Tapioca pudding**** — with ***Rice Cookies**** or ***Sugar-toasted Ry-Krisp**** if desired

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† For general information regarding Ralston diet, see appendix, p. 726.
* See Ralston Restricted Diet Recipes in appendix, pages 726 to 729.

WHEAT

Wheat is found in the following foods:

Beverages:

Postum, Ovaltine, malted milk, Cocomalt and beer.

Breads:

Muffins, popovers and biscuits if made with any wheat or malt products. Wheat breads include the following: Corn,* rye, gluten, Graham, soy, pumpernickel and white bread, rolls, crackers and pretzels. Rye products are not entirely free of wheat. The role of rye is to be studied individually.

Cereals:

Bran flakes, Crumbles, Crackels, Pep, Pettijohn's, Puffed Wheat, Ralston's Wheat Cereal, Farina, Cream of Wheat, Shredded Wheat, Grapenuts, Muffets, Wheatena and other cereals.

Flours:

Whole-wheat, white and Graham flours. Do not overlook mixtures with flour in them.

Some Salad Dressings.

Miscellaneous:

Gravies, sauces, hot cakes, griddle and wheat cakes, malt products, some yeasts and most cooked sausages; meat, fish and fowl rolled in flour. Synthetic pepper and ice-cream cones.

Pastries and Desserts:

Doughnuts, pies, cakes and cookies.

Wheat Products:

Bread and cracker crumbs, macaroni, noodles, vermicelli, spaghetti, zwieback, rusk and dumplings.

Important: Prepare foods in separate containers without contacting stuffings, dressings, sauces, gravies and frying fats.

Study the labels of all foods and determine if they contain wheat.

EGG

Egg is found in the following foods:

Egg Dishes:

Baked, coddled, hard-cooked, escalloped, fried, deviled, shirred, omelets, creamed, scrambled, poached, soft-cooked soufflés, dried, powdered and egg albumin.

Egg Recipes:

Baking powders, breaded foods, boiled dressings, cakes, macaroons, cookies, custards, noodles, malted cocoa drinks, marshmallows, dried eggs in foods, doughnuts, meringues, spaghetti, pretzels, fritters, egg drinks, sauces, whips, timbales, root beer, dumplings, waffles, Spanish cream, griddle cakes, frostings, candies, ice creams, macaroni, puddings, glazed rolls, pies, meat loaf, croquettes, patties, Bavarian cream, hollandaise and tartar sauces; bouillons, consommés, soups and coffee if cleared with egg.

Some of these can be made without egg.

You must determine if egg is used in your own brands of pastries, puddings and ice creams!

MILK

Milk is found in these foods:

Breads:

Except special brands, soda crackers, Cream of Rice.

Beverages:

Malted milk, chocolate or cocoa drinks.

Candies:

Milk chocolate and most other candies.

Recipes with milk:

Escalloped dishes, foods prepared au gratin, rarebits, soufflés and creamed foods; meat loaf, croquettes, Bologna and hash usually contain milk. Fish is often dipped in milk before cooking.

Milk and Dairy Products:

Butter, buttermilk, curd, cheese, whey and cream. All kinds of milk, . . . dried, condensed, evaporated, powdered, or any form of fresh milk, malted milk and goat's milk; also, all oleomargarines, sherbets, ice creams and mashed potatoes.

Desserts:

Cakes, cookies, custards, puddings, junket, spumoni, blanc mange, hard sauces and cream sauces.

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* Unless homemade without wheat.

Miscellaneous:

Gravies, omelets and scrambled eggs made with milk; bisques, chowders, milk and cream soups, prepared flour mixtures.

Note: Every kind and brand of cheese contains milk, but each is an individual food.

CORN*

Corn may be a cause of symptoms either as a food or an inhalant. Quite often there is a difference in the effect of different forms of corn. Thus, one might be able to eat canned corn, frozen corn and roasting ears, but not ripe corn products. In case you can eat unripe corn, it is very important for you to get specific instructions before continuing its use. Popcorn may be a cause of trouble when all other kinds of corn products are agreeable. Rice Krispies, Nescafé, oil in which fish is packed and certain white vinegars may contain corn.

FOODS IN WHICH CORN IS PRESENT

Such as corn: Roasting ears, canned or frozen corn, Grits, corn sirup, hominy, cornstarch, corn flakes, Kixs, succotash, corn meal, corn sugar, i.e., cerulose, dextrose and glucose; Mazola, Karo, parched and popped corn.

Corn is used in almost all: Sirups, fried fish, candy bars, tenderized hams, canned fruits,Δ ices and sherbets, candies, carbonated beverages, hearth-baked breads, cooked sausages, baking powder, marshmallows, ice creams, bacon,* ham,* preserves, jams, jellies, cream pies, cream puffs and sundae sauces and commercial yeasts.†

Corn is used in: Polished rice, Welch's grape juice, Jello, many breads, glucose products, chewing gums, powdered sugar, restaurant salt cellars, bourbon and other whiskies, beer, ale, mull-soy, Pablum, Linit, Kremel, Cream of Soy, salad dressings and foods fried in deep fat.

Corn is used in some: Brown sugars, tomato soups, catsups, cheeses, frozen fruits, i.e., cherries, peaches and strawberries, peanut butter, Graham crackers, soybean milks, sweet wines and fried foods.

Pharmaceuticals such as: Calcidrine sirup, calcidrine tablets, many vitamin preparations, lipoiodine, pills, capsules, tablets and sirups.

Corn is mixed with more foods than any other single food. YOU should find out: 1. If your baker uses cerulose in his breads and pastries. 2. If your brand of ice cream is free of corn. 3. If you are using breads baked on a hearth, i.e., panless loaves. You can eliminate this corn by cutting off the bottom crust to which the granules stick. The treatment of corn allergy is the elimination of every form of corn and all foods made with or containing any corn products. If you are sensitive to corn as an inhalant you must avoid popcorn machines. Swift's Premium ham and bacon and Armour's Star ham and bacon* are free of corn *at this time*. You must be on the alert for changes in the compounded foods you are using.

Δ Del Monte products are cornfree.

† Red Star Quick Rising Dry Yeast is cornfree.

* Corn list compiled by Rinkel and Randolph.

Diseases of the Urinary Tract

The diseases of the urinary tract in which diet may play a role are usually caused by a systemic intoxication, urologic bacterial invasion, metabolic errors or calculi. These factors, including the fluctuation in the water content of the body, are reflected in the urine as determined by a careful examination.

THE MOST IMPORTANT GENERAL FACTORS PROBABLY IN DIETARY TREATMENT OF DISEASES OF THE URINARY TRACT ARE:

1. To avoid foods considered as renal irritants;
2. To control acidity or alkalinity of the urine; and
3. To see that the fluid intake and output are adequate.

Foods Considered to Be Renal Irritants:

Alcohol and Alcoholic Beverages:

Champagne
Beer
Gin
Effervescent wines
Still wines
Whisky

Condiments:

Catsup
Horse-radish
Mustard
Pepper
Salt
Spices
Vinegar
Ginger

Vegetables, such as:

(a) Cucumbers
Pickles
Watercress
Radishes
Rhubarb

and those with a strong aroma, such as:

(b) Asparagus
Onions
Leeks
Cabbage
Cauliflower, etc.

These vegetables, although considered by many to be renal irritants, have not been proven to be harmful to the urinary tract.

Meat Extractives

Carbonated Waters

Discussion of diseases of the urinary tract may be divided into two parts: (1) Infections and (2) calculi of the urinary tract

INFECTIONS OF THE URINARY TRACT

Alkaline-Ash Diet. Changes in reaction of the urine are commonly resorted to in the treatment of urinary infection, including cystitis, pyelitis and pyelonephritis. In conditions in which the urine acidity or hyperacidity is contraindicated in the management of the disease, one is often called upon to render the urine alkaline. This may be accomplished rapidly by the administration of properly selected alkalis. However, the additional use of an alkaline-ash diet is indicated and may be a valuable adjunct in treatment. The author has presented on pages 578 and 579 an example of an alkaline-ash diet. The total excess of alkaline ash over acid ash expressed in grams is approximately eighty. In case it is necessary to intensify the alkalinity, the bread and the meat may be omitted from the diet, and larger quantities of milk, butter, sugar and cream may be used to meet the protein and the caloric requirements.

MEATS that may be used in small amounts in an alkaline-ash diet are:

Beef
Ham
Halibut
Veal
Lamb
Trout
Salmon

ALL VEGETABLES AND FRUITS (other than cranberries and prunes) should be emphasized in an alkaline-ash diet. However, the following have been found experimentally to be very efficient in reducing the acidity of the body:

- Apples
- Bananas
- Oranges
- Muskmelons
- Potatoes

60 Gm. Protein
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 205, Protein 60, Fat 125, Calories 2,185

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	90	3 slices
Butter	50	5 squares
Salad dressing with oil	30	2 tablespoons
Milk	1,000	5 glasses
Cream, 20%	30	2 tablespoons
Meat (lean)	45	1 small serving (1½ oz.)
Bacon		
Egg		
Vegetables, 3% Vegetables, 6%	400	4 servings
Fruit, 10–15%	400	4 servings
Potato	200	2 servings

60 Gm. Protein
2,200 Calories

Suggested Distribution of Total Food
Allowance for One Day

		Gm.
BREAKFAST		
Orange juice	½ glass	100
Fruit	1 serving	100
Toast	1 slice	30
Butter	1 square	10
Cream, 20%	2 tablespoons	30
Milk	1 glass	200
Beverage—coffee substitute		
A.M. 10:00 Milk	1 glass	200
LUNCHEON		
Potato	1 serving	100
Vegetable	1 serving	100
Salad:		
Fresh vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200
P.M. 3:00 Milk	1 glass	200
DINNER		
Meat	1 small serving	45
Potato	1 serving	100
Vegetable	1 serving	100
Salad:		
Fresh vegetable	1 serving	100
Salad dressing with oil	1 tablespoon	15
Bread	1 slice	30
Butter	2 squares	20
Fruit	1 serving	100
Milk	1 glass	200

Acid-Ash Diet. In certain conditions it may be advisable to render the urine acid. Urine can be changed quickly from alkaline to acid reaction by the administration of acid medication. The use of an acid-ash diet will accomplish this also and may be a valuable aid in treatment. The author has presented on page 582 an example of acid-ash diet. If the condition justifies a greater acid-ash residue, this can be accomplished by omitting milk, fruit and vegetables for a few days and adjusting the calories by addition of more of the neutral or acid-ash foods (see p. 16).

PROTEIN FOODS that should be emphasized in an acid-ash diet are:

- Eggs
- Chicken
- Beef
- Veal
- Oysters
- Haddock

VEGETABLES AND FRUITS that may be used in prescribed amounts in an acid-ash diet:

Vegetables:

- Asparagus
- Green peas, fresh
- Pumpkins
- Squash
- Turnips
- Mushrooms
- Cauliflower
- String beans, fresh
- Tomatoes, fresh
- Corn, canned or fresh*
- Cranberries†
- Prunes†

Fruits:

- Watermelons
- Grapes
- Pears, fresh
- Grape juice
- Cherry juice
- Raspberry juice
- Peaches, fresh

"Acid Fad" in Diet. Among the many ideas, fads and fancies about diet met with by the physician is the "acid fad" in diet. Many patients worry and attribute their ills to what they believe to be acidosis, resulting from the eating of acid foods. They feel that acid stomach, water brash and heartburn are all due to too much acid in the system from eating acid foods. They therefore eliminate many articles of food from the diet, thinking they produce acid in the body, and by so doing the diet is apt to become inadequate.

There is a great variation in gastric-acid secretion and very often the secretions bear little relation to the average diet. After organic disease is excluded the physician should realize that the acid secretions may be due to neurotic tendencies or to chronic nervous exhaustion and fatigue. Acid stomach, water brash and heartburn are not due to too much acid in the system from eating acid foods. The patient must be taught that taste does not indicate whether a food is acid or alkaline. For example, eggs and meat form acid in the body, while oranges, grapefruit and tomatoes form alkali. A diet which includes a generous amount of vegetables, fruits and milk is a well-balanced one.

ANY NONDIABETIC ACIDOSIS is due directly or indirectly to starvation. This starvation, with accompanying dehydration, may be the result of vomiting, diarrhea, anorexia, etc. This type of acidosis is treated by means of high carbohydrate feeding. If the patient is unable to take food by mouth, one must resort to intravenous glucose.

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* Corn, fresh or canned, 100 Gm. yield an excess acid of 1.8.

† The ash content of these foods is alkaline, but substances in them which form hippuric acid in the body increase the acidity of the urine.

95 Gm. Protein
2,240 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 195, Protein 95, Fat 120, Calories 2,240

Food	*Gram Weight*	*Household Measure*
Cereal (cooked)	140	⅔ cup
Bread	90	3 slices
Butter	40	4 squares
Salad dressing with oil		
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Meat (lean)	180	2 servings (6 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3% Vegetables, 6%	300	3 servings (1½ cups)
Fruit, 10%	200	2 servings
Corn or rice	200	2 servings
Sugar	5	1 teaspoon
Dessert	100	1 serving

95 Gm. Protein
2,240 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit	1 serving	100
Cereal (cooked)	⅔ cup	140
Bacon	2 slices	10
Egg	2	100
Toast	1 slice	30
Butter	1 square	10
Cream, 20%	¼ cup	60
Sugar	1 teaspoon	5
Beverage—coffee substitute		
LUNCHEON		
Meat	1 large serving	90
Corn or rice	1 serving	100
Vegetable	1 serving	100
Bread	1 slice	30
Butter	1½ squares	15
Fruit	1 serving	100
Milk	1 glass	200
DINNER		
Meat	1 large serving	90
Corn or rice	1 serving	100
Vegetables	2 servings	200
Bread	1 slice	30
Butter	1½ squares	15
Dessert	1 serving	100
Milk	1 glass	200

CALCULI OF THE URINARY TRACT

A great deal of research has been done in the use of acid-ash diets, and vitamins in the therapy and the prevention of renal calculi have been demonstrated. Higgins, in reporting his investigations dealing with the experimental production of urinary calculi, has shown that rats maintained on a diet deficient in vitamin A developed urinary lithiasis. He concludes that an acid-ash diet, high in vitamins, especially A, is important as a preventive following operation for urinary calculi.

Calculi are formed by a collection of crystals of precipitated urinary salts round a nucleus of bacteria, mucus, pus, blood or a foreign body. Calculi of the urinary tract are composed of phosphates, urates, oxalic acid, cystine, or frequently mixtures of these crystals of precipitated urinary salts. Because of this fact, the dietary treatment of calculi of the urinary tract is directed particularly against the phosphates, uric-acid or oxalic-acid content of various foods, depending upon the type of calculus present. It is difficult to say how much can be accomplished through dietary restrictions in calculi of the urinary tract, but certainly following the removal of a calculus—by major surgery, endovesical instrumentation or the passing of a small stone while voiding—it is extremely important to advise the patient what foods to restrict, depending upon the composition of the calculus, in an effort to prevent a recurrence. Often patients complain of urinary symptoms simulating renal colic or even pass small, sandlike concretions, and yet they show no evidence of calculi by roentgenologic or cystoscopic examination of the kidney tract. These patients do not object to dietary discipline and they may be relieved of their symptoms by the restriction of foods containing more than a trace of oxalic acid, uric acid or phosphates.

Diet restrictions suitable for these procedures follow in the discussion of oxaluria, phosphaturia and uraturia.

OXALURIA

The dietary treatment of oxaluria should be regulated to avoid those foods that have a high oxalic-acid content, such as:

Cocoa
Chocolate
Black tea
Coffee
Sorrel
Spinach
Rhubarb
Figs, dried
Potatoes
Beans
String beans

Cabbage
Gooseberries
Plums
Endives
Strawberries
Tomatoes
Beets
Celery
Bread
Grapefruit

The diet should be composed of foods that contain small traces or no oxalic acid, such as:

Meat, muscle
Lentils
Peas
Rice
White cabbage
Cauliflower
Turnips
Asparagus
Pickles
Milk
Butter
Fats
Sugars

Onions
Leeks
Lettuce
Pears
Apricots
Cherries
Grapes
Melons
Mushrooms
Cream
Eggs
Starches

Liberal amounts of milk should be used so as to provide sufficient calcium to precipitate oxalates and thus prevent their absorption.

PHOSPHATURIA

The cause of phosphaturia is a debatable question. Many authorities feel that it is of neurotic origin because it is found so frequently in highly emotional and nervous individuals. Probably an acid-ash diet, such as is presented on page 582, will be the most beneficial.

URATURIA

The diet for uraturia should, as far as possible, be free of purine or low in it (see pp. 175, 176 and 178–181).

Addison's Disease

Nature of the Disease

Results from the destruction of the cortex of the suprarenal glands.

Object of the Diet

To restrict the intake of potassium.

The characteristics of Addison's disease are marked asthenia, great feebleness of the heart action, irritability of the stomach, anemia, and a peculiar brown pigmentation of the skin and the mucous membranes.

IMPORTANT FACTORS IN DIETARY TREATMENT OF ADDISON'S DISEASE

1. Potassium: Rigid restriction
2. Food preparation: By special method to reduce potassium content
3. Protein: Normal; calculated to meet individual needs
4. Calories: Adequate to maintain nutrition
5. Diet supplementation: With a vitamin B_1 concentrate

These factors need some further discussion.

Potassium: Rigid Restriction. The potassium content (4 to 5 Gm.) of the average normal diet has been shown to have unfavorable effects on the course of Addison's disease. The diet should be restricted in potassium by use of highly refined breads, cereals and sugars. In order to keep the potassium intake at a minimum level (less than 2 Gm.) it is necessary to prepare and cook meats and vegetables by special methods.

Food Preparation: By Special Method to Reduce Potassium Content. The potassium content of vegetables may be reduced from 6 to 70 per cent by cutting them into small pieces and cooking them in from six to eight times as much water as is ordinarily used. Cut meats into small pieces and cook in a parchment paper bag. To one part meat use six or eight parts water. Meat loses at least one fourth of its potassium content if cooked by this method. Detailed method of special preparation and cooking of vegetables and meats is found on page 713.

Protein: Normal; Calculated to Meet Individual Needs. The protein content of the diet should be calculated to meet the accepted dietary standard of 1.5 Gm. of protein per kilogram of body weight. Approximately 70 Gm. of protein will be adequate in most cases.

Calories: Adequate to Maintain Nutrition. The diet planned should be adequate to maintain normal body weight. The potassium content of foods such as butter, mayonnaise and refined sugar is negligible and should be added or subtracted to regulate the caloric intake.

Diet Supplementation: With a Vitamin B_1 Concentrate. The diet restricted in potassium very probably is deficient in vitamin B_1. This is due to the fact that the highly milled cereals and white sugar which it is necessary to use in order to keep the potassium content less than 2 Gm. are poor sources of vitamin B_1. Also, no doubt, there is a greater loss of vitamin B_1 in the special cooking of vegetables and meats than by the ordinary methods. Because of this fact 1 mg. of vitamin B_1 should be given daily as a supplement to the diet.

DIRECTIONS FOR APPLICATION OF THE DIET

The diet for a patient with Addison's disease should be carefully weighed or measured out in household measures. The patient must take only those foods and food accessories listed in the diet and the method of special preparation of the cooking of vegetables and meats should be clearly explained to him. No substitutions should be made that will increase the amount of potassium in the diet or make it deficient in any of the food essentials.

Foods Allowed in the Treatment of Addison's Disease

- Cereals, highly refined:
  - Corn flakes
  - Cream of Wheat
  - Farina
  - Puffed Wheat
  - Puffed Rice
  - Rice, polished
  - Rice Krispies
- Bread, white
- Sugar, white
  - Candy, plain, white sugar
- Milk, in limited amount
- Cream
- Butter and all fats
- Eggs, in limited amount
- Vegetables, specially cooked (table, p. 714.
- Fruits, raw or cooked
- Meats specially cooked, in limited amount

Foods Avoided in the Treatment of Addison's Disease

- Whole-grain-cereal products:
  - Bran
- Soup:
  - Meat soup, broths and gravies containing meat stock or meat extracts
- Condiments: all highly seasoned sauces and relishes:
  - Meat sauces
  - Chili sauce
  - Mustard
  - Horse-radish
- Nuts of all kinds
- Dried fruits
- Dried legumes
- Molasses
- Beverages:
  - Coffee
  - Tea
  - Postum
  - Chocolate
- Phosphate and tartrate baking powders

GENERAL CONSIDERATION OF PROBLEMS IN TREATING ADDISON'S DISEASE

Clinical investigations made by Wilder, Kendall and associates indicate that the best therapeutic results in the treatment of Addison's disease demand not only the administration of active extracts of suprarenal cortex, together with sodium chloride and sodium citrate or bicarbonate, but also restriction of the dietary intake of potassium as outlined in this chapter. Directions for preparing a drink containing the amount of sodium chloride, usually prescribed per day in the treatment of Addison's disease, will be found on page 714.

In the treatment of complications of Addison's disease, such as anemia, it is important to call attention to the fact that liver extract, which is frequently prescribed, contains considerable potassium. One cc. of Lederle's concentrated solution of liver extract contains 1 mg. of potassium per ampule. One capsule of Cupron was found to contain 0.4 mg. of potassium. One might, therefore, unwittingly add potassium by treating the anemia and counteract the effect of giving a low potassium diet.

It is a mistake to give adrenal-cortex extract for long periods of time unless indisputable evidence has been obtained of the existence of adrenocortical insufficiency. The diagnostic test to aid in determining whether adrenal insufficiency is present or not was introduced by Harrop and his associates, and is of value. The test originally was performed by subjecting the patient to a diet very low in sodium chloride and high in potassium. The diagnosis was considered positive if symptoms of crisis developed, accompanied by subnormal values of sodium in the blood. This procedure has been modified by Wilder and associates, who gave on the first three days of the test a diet containing 4 Gm. of potassium, when potassium citrate was added to bring the total intake of the potassium ion up to 6 Gm. daily. Then the following three days the total intake of potassium was raised to 9 Gm.

It should be emphasized that while there is no apparent risk in the restriction of sodium chloride and the administration of potassium in this diagnostic test when the adrenal glands are normal, it is a dangerous procedure when severe adrenal insufficiency exists. The test should be made only when the patient is at rest in bed or confined to the room, when adequate nursing attention is available and facilities are at hand for immediate intravenous injection of sodium chloride, sodium citrate and adrenal-cortex extract should an emergency crisis develop.

Low Potassium Diet

73 Gm. Protein
2,802 Calories
1.994 Gm. Potassium

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 326, Protein 73, Fat 134, Calories 2,802

Food	*Gram Weight*	*Household Measure*
Cereal, Group 1 (dry weight)	35	2 average servings
Bread, white (may be toasted)	90	3 slices
Butter	50	5 squares
Salad dressing with oil (mayonnaise)	15	1 tablespoon
Milk	300	1½ glass
Cream	150	⅔ glass
*Meat (specially cooked)	5	2½ oz.
Bacon	10	2 small strips
Eggs	100	2 eggs
*Vegetables (Group 1)	100	1 serving (½ cup)
*Vegetables (Group 4)	100	1 serving (½ cup)
*Fruit (Group 2)	200	2 servings
Fruit (Group 3)	100	1 serving
Potato (specially cooked)	100	1 serving (½ cup)
Sugar	150	10 tablespoons

* See page 713 for direction for special preparation and cooking of meat and vegetables. Tables giving the potassium content of food on pages 592, 593, 715 and 716.

Low Potassium Diet

73 Gm. Protein
2,802 Calories
1.994 Gm. Potassium

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

BREAKFAST		
		Gm.
Fruit from Group 3 (preferably raw)	1 average serving	100
Cereal from Group 1	1 average serving	15
Eggs	1	50
Bacon	2 small strips	10
Bread, white (may be toasted)	1 slice	30
Butter	1 square	10
Cream	½ cup (scant)	90
Sugar (use in fruit and cereal)	4 tablespoons	60
DINNER		
*Meat, specially cooked	1 fairly large serving	75
Potato, specially cooked	1 serving (½ cup)	100
*Vegetable, from Group 1	½ cup	100
Bread, white	1 slice	30
Butter	2 squares	20
Fruit from Group 2	1 serving (½ cup)	100
Cream	2 tablespoons	30
Milk	1 glass	200
Sugar (use in food)	3 tablespoons	45
SUPPER		
Egg	1	50
Vegetables from Group 4 (preferably raw)	1 serving	100
Mayonnaise	1 tablespoon	15
Bread, white	1 slice	30
Butter	2 squares	20
Fruit from Group 2	1 serving	100
Cream	2 tablespoons	30
Milk	½ glass	100
Cheese	1-inch cube	20
Sugar (use in food)	3 tablespoons	45

* See page 713 for direction for special preparation and cooking of meat and vegetables. Tables givng the potassium content of food on pages 592, 593, 715 and 716.

Classification of Vegetables According to Potassium Content, Expressed in Grams per 100 Gm.

Group 1 Range, 0.05–0.10 Average, 0.075	Group 2 Range, 0.1–0.15 Average, 0.125	Group 3 Range, 0.15–0.25 Average, 0.2	Group 4 Range, 0.25–0.35 Average, 0.3	Group 5 Range, 0.35–0.45 Average, 0.4	Group 6 Range, 0.45–0.55 Average, 0.5
		FRESH*			
		Artichokes Asparagus Corn Cucumbers Eggplant Green peppers Hominy Leeks Onions Onions, spring Radishes Squash, summer	Cabbage Cabbage, red Carrots Cauliflower Celery Chard, Swiss Lettuce Peas Pumpkin Romaine Rutabaga Squash, Hubbard String beans Tomatoes Turnips Turnip tops Water cress	Beets Brussels sprouts Endive Kohlrabi Mushrooms Parsnips Potatoes, sweet	Dandelion greens Potatoes Spinach
		SPECIALLY COOKED			
Asparagus Carrots Corn (in parchment paper) Onions Pumpkin Rutabaga Squash, Hubbard Turnips	Cabbage Cauliflower Kohlrabi Parsnips Peas Potatoes String beans Tomatoes (in parchment paper)	Beets (in parchment paper) Brussels sprouts Spinach			
		CANNED			
String beans Wax beans	Peas	Asparagus Corn Spinach Tomatoes			

* Fresh vegetables may be consumed raw or cooked in any way desired.

Classification of Fruits According to Potassium Content, Expressed in Grams per 100 Gm.

Group 1 Range, 0.05–0.1 Average, 0.075	Group 2 Range, 0.1–0.15 Average, 0.125	Group 3 Range, 0.15–0.25 Average, 0.2	Group 4 Range, 0.25–0.35 Average, 0.3	Group 5 Range, 0.35–0.45 Average, 0.4
		FRESH*		
Blueberries	Apples	Cherries	Apricots	Avocados
Cranberries	Lemons	Blackberries	Cantaloupes	Bananas
Huckleberries	Lemon juice	Gooseberries	Currants, red	Currants, black
Pomegranates	Pears	Grapefruit	Currants, white	Limes
Watermelons	Strawberries	Grapes, black	Figs, green	Rhubarb
	Tangerines	Oranges	Loganberries	
		Orange juice	Mulberries	
		Peaches	Nectarines	
		Plums, red	Persimmons	
		Quinces	Pineapples	
		Raspberries	Plums, greengage	
		CANNED		
Pears	Peaches	Apricots		
	Pineapples	Grapefruit		
	Raspberries			

Classification of Cereals According to Potassium Content, Expressed in Grams per 100 Gm.

Group 1 Range, 0.05–0.15 Average, 0.1	Group 2 Range, 0.2–0.4 Average, 0.3
Corn flakes	Grape nuts
Cream of Wheat	Cornmeal
Farina	Oatmeal
Puffed wheat	
Rice, polished	
Puffed rice	
Rice Krispies	

* Fresh fruits may be consumed raw or cooked in any way desired.

A FEW SUGGESTED SUBSTITUTIONS FOR THE LOW POTASSIUM DIET

I. In place of 100 Gm. of fruit in Group 3 substitute one of the following:

	Gm.	*Approximate measure*
1. Fruit from Group 1	265	1⅓ cups
2. Fruit from Group 2	160	¾ cup
3. Fruit from Group 4	65	⅓ cup
4. Fruit from Group 5	50	¼ cup
5. Vegetable from Group 1	265	1⅓ cups
6. Vegetable from Group 2	160	¾ cup
7. Vegetable from Group 3	100	½ cup
8. Vegetable from Group 4	65	⅓ cup
9. Vegetable from Group 5	50	¼ cup

II. In place of 100 Gm. of specially cooked potato substitue one of the following:

1. Vegetable from Group 1	165	¾ cup
2. Vegetable from Group 2	100	½ cup
3. Vegetable from Group 3	65	⅓ cup
4. Vegetable from Group 4	40	¼ cup, scant
5. Fruit from Group 1	165	¾ cup
6. Fruit from Group 2	100	½ cup
7. Fruit from Group 3	65	⅓ cup
8. Fruit from Group 4	40	¼ cup
9. Fruit from Group 5	30	⅛ cup

III. In place of 100 Gm. of vegetables in Group 1 substitute one of the following:

1. Vegetable from Group 2	60	¼ cup
2. Vegetable from Group 3	40	¼ cup, scant
3. Vegetable from Group 4	25	⅛ cup, scant
4. Fruit from Group 1	100	½ cup
5. Fruit from Group 2	60	¼ cup
6. Fruit from Group 3	40	¼ cup, scant

IV. In place of 100 Gm. of fruit in Group 2 substitute one of the following:

1. Fruit from Group 1	165	¾ cup
2. Fruit from Group 3	65	⅓ cup
3. Fruit from Group 4	40	¼ cup, scant
4. Fruit from Group 5	30	⅛ cup
5. Vegetable from Group 1	165	¾ cup
6. Vegetable from Group 2	100	½ cup
7. Vegetable from Group 3	65	⅓ cup
8. Vegetable from Group 4	40	¼ cup, scant

V. In place of 100 Gm. of vegetables in Group 4 substitute one of the following:

	Gm.	*Approximate measure*
1. Vegetable from Group 1	400	2 cups
2. Vegetable from Group 2	240	1¼ cups
3. Vegetable from Group 3	150	¾ cup, scant
4. Vegetable from Group 5	75	⅓ cup
5. Fruit from Group 1	400	2 cups
6. Fruit from Group 2	240	1¼ cups
7. Fruit from Group 3	150	¾ cup
8. Fruit from Group 4	100	½ cup
9. Fruit from Group 5	75	⅓ cup

VI. In place of 25 Gm. of dry rice substitute one of the following:

1. Bread, white	15	½ slice
2. Macaroni, cooked	50	¼ cup
3. Spaghetti, cooked	50	¼ cup
4. Noodles (without eggs), cooked	50	¼ cup

VII. In place of 15 Gm. of cereal in Group 1 substitute one of the following:

1. Bread, white	15	½ slice
2. Cereal from Group 2 (when this substitution is made, 1 slice of bread must be omitted)	15	½ cup

VIII. In place of one egg substitute one of the following:

1. Canned crab	30	1 small serving
2. Canned shrimp	60	1 average-sized serving
3. Canned salmon	25	1 large tablespoon
4. Sardines, canned in oil	15	1 sardine 3 inches long
5. Fish (cooked in any manner)	25	1 small serving
6. Oysters, large	50	3 or 4
7. Cheese (all kinds)	40	2 cubic inches or ¼ cup
8. Milk	50	¼ glass
9. Meat, cold sliced	20	1 small serving

Substitutions for specially cooked meat:

One egg is equivalent in content of potassium to 75 Gm. (1 serving) of specially cooked meat. Therefore, any one of the egg substitutes may be taken in place of the meat.

Substitutions for milk:

1. Cream sauce for vegetables and meat may be taken, provided an equal portion of milk is omitted.
2. Cream vegetable soup may be taken, provided equal portions of milk and vegetables are omitted.
3. Ice cream (vanilla flavor) may be taken, provided an equal portion of milk or cream is omitted.

Hyperinsulinism

Nature of the Condition

Excessive secretion of insulin by the islet cells of the pancreas

Object of the Diet

To inhibit the secretory activity of the islet cells

Hyperinsulinism has been called the hunger disease because most patients have an excessive appetite and feel the need of food between meals. Often weakness, nausea, vomiting, and occasionally abdominal distress, are temporarily relieved by food.

Before making a diagnosis of hyperinsulinism, repeated blood-sugar studies should be made. The glucose tolerance test should be continued over a period of six hours rather than the four hours usual in diagnosing diabetes. This six-hour procedure is necessary because some patients with chronic hyperinsulinism may show a diabetic curve for the first three or four hours and a hypoglycemic reading for the fifth and the sixth hours.

When it is impossible to get a glucose tolerance test, the procedure is rest and a low carbohydrate diet for at least five days. The total food allowance for one day should be divided into six to eight feedings and given every two hours. This diet with sufficient rest should give relief if the symptoms were due to hypoglycemia.

IMPORTANT FACTORS IN THE DIETARY TREATMENT OF CHRONIC HYPERINSULINISM

1. Maintenance of nutrition
2. Carbohydrate: Low (no quickly absorbed carbohydrates, such as sugar)
3. Fat: High, and mixed with the carbohydrate foods
4. Feedings: Frequent—from five to seven daily

The diet in chronic hyperinsulinism should be planned in each case to maintain nutrition. The dietary problem is much the same as in diabetes. It would seem from the nature of the disease that a high carbohydrate diet is indicated. However, John has stated that carbohydrates stimulate the secretion of insulin and when concentrated or rapidly absorbed carbohydrates (such as sugars) are given, there is a stimulation of the insulin secretion, which continues after the carbohydrates are metabolized, and hypoglycemia results.

Harris and others report good results in treating patients with chronic hyperinsulinism by giving a low carbohydrate, high fat diet consisting largely of 3, 6 and 10 per cent vegetables and fruits, combined with large proportion of fats, especially butter and cream. Since fats are emptied slowly from the stomach, it is possible that in slowing up digestion by combining fats with a low carbohydrate intake, metabolism will also be proportionately slow. The foods metabolized will be released in small amounts, and stimulation of insulin secretion will be less than when the diet is made up largely of carbohydrate foods.

In order to relieve symptoms and keep the blood sugar as near a constant level as possible, the total daily food allowance should be given in from five to seven feedings, and at no time should quickly absorbed carbohydrates, such as sugar, be allowed in beverages or any other foods.

Inasmuch as the dietary treatment of chronic hyperinsulinism is practically the same as that of diabetes, the author suggests the use of the diets and the food substitutions given on pages 106 to 113 and 148. The following two pages show how the total food allowance of these diets may be divided into five to seven feedings during the day. The diabetic diet selected is one of Series 1 on pages 110 and 111.

100 Gm. Carbohydrate
2,200 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 100, Protein 61, Fat 175, Calories 2,219, Sugar Value 153

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread	60	3 thin slices
Muffin, bran soy		
Butter	105	10½ squares
Salad dressing with oil	30	2 tablespoons
Milk	400	2 glasses
Cream, 20%	60	¼ cup
Cream, 40%		
Meat (lean)	75	1 serving (2½ oz.)
Bacon	15	3 slices
Eggs	100	2
Vegetable, 3%	300	3 servings (1½ cups)
Vegetable, 6%	100	1 serving (½ cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

100 Gm. Carbohydrate
2,200 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

				Gm.
		BREAKFAST		
A.M.	8:00	Fruit, 10%	1 serving	100
		Bacon	3 slices	15
		Egg	1	50
		Bread (toast)	1 thin slice	20
		Butter	2 squares	20
		Cream	1 tablespoon	15
		Beverage—coffee, tea or coffee substitute		
	10:00	Milk	1 glass	100
		Cream	1 cup, scant	45
		LUNCHEON		
M.	12:00	Egg or egg substitute	1	50
		Vegetable, 3%	1 serving	100
		Salad:		
		Vegetable, 3%	1 serving	100
		Salad dressing with oil	1 tablespoon	15
		Bread	½ thin slice	10
		Butter	3½ squares	35
		Fruit, 10%	1 small serving	75
		Beverage—weak tea or coffee substitute		
P.M.	3:00	Fruit	½ serving	50
		Bread (toast)	1 thin slice	20
		Butter	1 square	10
		DINNER		
	6:00	Meat	1 serving	75
		Vegetable, 6%	1 serving	100
		Salad:		
		Vegetable, 3%	1 serving	100
		Salad dressing with oil	1 tablespoon	15
		Bread	½ thin slice	10
		Butter	4 squares	40
		Fruit	1 small serving	75
		Beverage—weak tea or coffee substitute		
	9:00	Milk	1 glass	200

Protein and Amino Acids in Nutritional Therapy

DAILY PROTEIN NEEDS
EFFECTS OF INSUFFICIENT PROTEIN INTAKE
RESISTANCE TO INFECTION
ANEMIA
PREGNANCY AND LACTATION
DISEASES OF THE KIDNEY
DISEASES OF THE LIVER
PEPTIC ULCER
MISCELLANEOUS CONDITIONS NEEDING PROTEIN CONSIDERATION
AMINO ACIDS AS PROTEIN NOURISHMENT

It has long been recognized that protein is an important essential dietary component and constituent of all living tissue. However, appreciation of its particular value as a prophylactic and therapeutic agent has developed only within the last few years.

The rise of interest in protein to a place of therapeutic importance is the result of intensive studies over the years to determine the precise relationships of protein intake, the body protein levels and tissue function. As early as 1920 some of the work was being reported which laid the foundations for the practical applications being made today. The extensive investigations of Whipple and his associates during this period demonstrated the importance of the liver in plasma-protein production. This concept is basic to an understanding of some of the protein disorders of the body.

The protein of the food yields the amino acids, which are absorbed from the intestinal tract, and the amino acids are then synthesized in the liver cells and elsewhere into plasma protein. These plasma proteins and amino acids supply the protein requirements of the body cells. Normally, there is a considerable reserve of plasma-protein-forming material, which reserve may be reduced by fasting, low protein diet or plasma depletion. This depletion of protein reserves lowers the body resistance to infection and intoxication. These body protein stores, protein production and protein wear and tear are in a balanced equilibrium. These proteins can pass from plasma into cells—and the reverse—without loss of nitrogen. Whatever our concept of protein molecules and their passage through cell surfaces, we must admit that protein does not pass through cell surfaces readily as a part of the normal protein metabolic exchange. Hemoglobin in its production may derive in part from plasma protein, but hemoglobin contributes to the protein pool for exchange only when the red cell is destroyed, and then after separation of the iron and complete loss of the pigment radical to the liver and the bile. The body jealously guards the fabrication of hemoglobin, and, given a real need for both plasma protein and hemoglobin—for example, in a case of anemia and hypoproteinemia—the protein flow favors hemoglobin. In these circumstances the hemoglobin is always produced in greater abundance than is the plasma protein.

The daily requirement for protein is very important but often is forgotten. If the daily needs of protein are not met, losses become cumulative and may lead to chronic protein deficiencies. Although plasma proteins represent but a small part of the total body protein, this quantitative relationship is constantly maintained both in health and in disease. An estimate of this quantitative metabolic relation was first observed by Weech, who described experimental evidence showing that during protein starvation the losses from plasma albumin and the rest of the body had a constant and definite relationship of roughly one to thirty. In other words, for every gram of plasma albumin lost or gained, 30 Gm. of tissue protein are lost or gained during protein starvation or feeding, respectively.

We should like to mention a few mechanisms by which protein is lost from the body. First, the physiologic loss represents the protein tissue used up by the normal catabolic process of the body and is often referred to as endogenous or due to normal wear and tear. In an adult of average size, this amounts to about 4 Gm. of nitrogen per day. Second, protein tissue may be broken down to supply calories whenever an insufficient amount of carbohydrate is taken in the food. This loss of course can be prevented entirely by an adequate amount of the nitrogen-sparing carbohydrate. Third, considerable tissue protein is lost in many conditions, apparently because of the peculiar phenomenon often referred to as the toxic destruction of protein. This is observed following extensive trauma and surgical operations and in various types of infections. This loss may reach as much as 30 or more Gm. of nitrogen a day, or the equivalent of two pounds of muscle tissue. Browne, Howard, Peters and others state that this component of the nitrogen loss cannot be replaced by concurrent dietary protein. Fourth, in addition to the catabolic loss, protein escapes directly as such in a great variety of cases, the simplest of course being the loss of blood by hemorrhage. Extensive losses also occur in other conditions in which plasma alone, or other protein-containing fluid, escapes to the outside, such as burns; general peritonitis with large amounts of protein lost in the walls of the intestines or from the extensive surface of the peritoneum into the peritoneal cavity; extensive trauma, with crushing injuries, involving loss of plasma into the traumatized area; extensive infections in which a great deal of discharge occurs and produces a loss of protein in the exudate of pus.

It has become customary to use the measurement of nitrogen balance as an indication of the state of protein metabolism, very much as water balance is used to measure the degree of water exchange.

DAILY PROTEIN NEEDS

Under normal conditions, as stated in the discussion of protein in health, page 5, the amount of protein is about 1 Gm. per Kg. in the normal dietary requirement of a well-balanced diet. Thus, under normal conditions, about 10 Gm. of nitrogen or 62½ Gm. of protein will ordinarily lead to positive nitrogen balance. However, from what we have just discussed with regard to catabolic protein losses, it can plainly be seen that the daily protein needs vary tremendously. The catabolic loss of body protein that occurs as a result of tissue breakdowns, normal or abnormal, can be measured readily by collecting the entire 24-hour urine and stool output and determining the content of nitrogen. This is possible because all body protein when broken down is excreted largely as simple nitrogenous compounds, such as urea and ammonia, in the urine, which thus furnish an excellent reflection of the degree of protein catabolism. By multiplying the total nitrogen loss by 6.25, the actual weight of protein lost is calculated simply. To calculate the weight of tissues—such as muscle, for example—one must multiply by 5, inasmuch as muscle protein is bound to four volumes by weight of water. Thus, the rough factor, thirty times the total nitrogen excretion, represents the approximate weight of muscle broken down.

When one stops to consider just how extensively protein substance participates in the body processes, it is surprising that functional disorders do not occur more frequently as a result of temporary reductions in dietary supply. Our bodies are dependent upon the continuous activity of such protein compounds as hormones to regulate body processes, enzymes to digest foods, plasma albumin to maintain body water balance, globulins to resist infection and hemoglobin to transport oxygen to the tissues, in addition to the over-all needs for growth and repair of tissue breakdown. These requirements can be met regularly in spite of fluctuations in intake because of the reserve supply of protein. There is evidence that this reserve is not a fixed quantity contained in the tissues; instead, it exists as a mobile store which moves from the fixed tissues to the circulation and back as occasion may demand.

There are no noticeable effects upon the body economy as a result of deficiencies in protein intake of brief duration. However, the same does not hold true for the more prolonged deprivation, for after a period of time certain disorders are found to occur in healthy individuals whose protein intake is deficient. The diseased person is subject to these same effects of protein lack, whether due to reduced protein intake, excessive losses from the body, failure of synthesis or toxic destruction. The potential effects upon the body are the same, and it would be well to discuss them at this point.

EFFECTS OF INSUFFICIENT PROTEIN INTAKE

The most generally recognized and commonest manifestation of protein depletion is hypoproteinemia, characterized by a blood protein level below the normal range of 6.5 to 7.5 Gm. per 100 cc. A fall in the albumin fraction of the blood proteins is predominantly responsible for this change. As a result, the circulating blood cannot hold the amount of fluid which normally remains in colloid equilibrium with this plasma protein. Fluid passes out of the circulation into the body tissues, where it exists as edema. This causes an upset in the fluid and electrolyte balance of the body, and the efficiency of many body functions is impaired. In some instances there is insufficient circulating fluid to maintain proper blood pressure.

RESISTANCE TO INFECTION

Although edema has long been recognized as the principal sign of hypoproteinemia, there are other effects which can be related to reduction of the body proteins. The recent investigations of Cannon demonstrate the inability of the protein-depleted animal to form antibodies in response to specific infections. The source of the antibodies of an acquired immunity is postulated by Cannon to be the intracellular protein reserve. This represents a breakdown in an essential body-defense mechanism.

This concept of the close relationship

between protein substance, antibodies and resistance was first suggested during World War I when it was observed that individuals with dietary deficiencies, among which protein predominated, showed increased susceptibility to infectious disease. This suspected relationship has been confirmed by the work of Cannon and others in animals maintained upon low levels of dietary protein. It is a common observation, too, that patients showing prolonged loss of blood and body proteins in such diseases as nephrosis and nephritis, or those with malignancy or cirrhosis of the liver often succumb to terminal infection. Their capacity to form antibodies is inadequate to hold these infections in check. This, then, is a consequence of body-protein depletion which may be found in either healthy or diseased individuals.

ANEMIA

At present, one further effect upon the body which may result from protein deficiency is recognized. This is the occurrence of anemia, either macrocytic, large-cell type or hypochromic, low hemoglobin variety. The development of anemia as a consequence of reduction in the body protein is readily appreciated when one considers that the blood-cell framework is composed of lipids and protein, while the hemoglobin within the cell is 95 per cent protein substance. Clinical observations confirm the conjectural possibility of the development of anemia. Youmans has reported finding hypochromic anemia in cases of nutritional edema, wherein it was apparent that the protein supply was inadequate for plasma-protein production and also for normal blood formation. Macrocytic or primary type anemia has also been found to occur in the presence of hypoproteinemia. Hematologic study of a group of anemic patients showed that all those with serum albumin level below 4 Gm. per 100 cc. had a macrocytic anemia.

A protein-deficiency element has been associated with pernicious anemia. The present concept of this disease depicts a lack of either of two substances: an intrinsic factor of the gastric juice, thought to be an enzyme, or an extrinsic factor found in meat, particularly in liver. Both these essentials appear to be protein in nature, and in view of the common history of a long-standing dislike of or a poor tolerance for meat among pernicious-anemia patients, a latent protein deficiency may contribute to the development of the disease. Actually, a large percentage of such patients have been shown to have low plasma-protein levels. There thus appears to be substantial evidence to indicate that anemia is one of the conditions to be anticipated when the protein supplies of the body are reduced for one reason or another.

These three conditions of hypoproteinemia, reduced resistance to infection by interference with antibody production, and anemia are potential sequelae of any prolonged depletion of the body-protein stores. Their development is to be expected in any individual whose tissues have been drained appreciably of the normal protein reserves. It is significant that such effects are not necessarily associated with coexisting disease but may be due to factors outside the body, particularly an inadequate supply of protein in the diet.

In addition to the important effects of protein lack just described, there are numerous other special situations in which an abundant supply of protein has been shown to be of specific protective value. In practically every instance a special type of diet is indicated, and the protein content of the diet therefore merits special attention.

PREGNANCY AND LACTATION

Attention should be focused upon the protein intake, especially during pregnancy. While there are increased requirements for several factors in addition to protein, it is one of the essentials for which there is greater need. Protein is a building material and pregnancy is concerned with the building of a new body. Storage of nitrogen by the mother, as shown by a positive nitrogen balance, may begin as early as the tenth week of gestation. The amounts stored are often in excess of the requirements for growth of the fetus and the mother's metabolism. This excess may be stored for subsequent use in lactation. The growth needs of the fetus must be met, and if adequate dietary protein is not supplied the mother's protein stores will be drained. With normal dietary intake during pregnancy, the blood-protein level has been found to be below normal averages during the first six months. If the protein supply is reduced, further reduction in these values will result. Aside from the obvious undesirable effect of depletion of the mother's protein stores, definite dangers are encountered in pregnancy and have been attributed to protein deficiency in the mother, either as the result of an acute deficiency associated with excessive vomiting or because of long-standing deficit. Such complications of pregnancy as toxemia with mild elevation of blood pressure, edema and preeclampsia have been observed by some investigators to occur several times more frequently in patients having protein intakes below normal levels. The course of these complications can be influenced favorably by correction of the protein deficit.

The demands for protein during lactation are even greater. Preparation must first be made by enlargement of the breast tissue, which in itself has been estimated to require storage of as much as 17 Gm. of nitrogen. A continuing supply of protein is then needed for the production of milk. In animals, the milk yield has been shown to vary directly with the protein intake.

One further reason for providing a liberal supply of protein during pregnancy and lactation lies in the favorable effect which protein has upon calcium absorption. A high protein intake actually can increase the absorption of calcium several fold; and, after absorption, about half the serum calcium exists in combination with the blood proteins which, if reduced, likewise reduce the serum calcium and limit the transport of calcium to the growing fetus.

DISEASES OF THE KIDNEY

For a good many years there has been some diversity of opinion as to the desirability of high protein diets in diseases of the kidney. Those opposing the use of such diets based their views on limited observations of apparent kidney damage resulting from administration of very high protein levels to animals. Such an effect in man has never been shown. Another basis for favoring the low protein diet lay in the belief that excretion of nitrogen-containing waste products imposed a burden on the injured kidney. It has now been shown that kidney function must be reduced by more than 50 per cent before an impairment in excretion of nonprotein nitrogenous products becomes apparent. Therefore it is only when kidney function is greatly reduced that lowered protein intake is necessary.

On the other hand, actual improvement in the well-being of nephritic patients may be observed following the use of high protein diets both in adults and in children. In some instances, functional capacity of the kidneys has been reported to improve on such a regimen, whereas there had been no improvement prior to increasing the protein intake. The amount of protein required should be determined by the circumstances. In general, when there is urinary protein loss, it should be replaced as nearly quantitatively as possible. There is also an increased catabolism or protein breakdown in the body when the nephritic condition is active, which calls for more protein. It has been suggested that 75 Gm., plus the amount lost in the urine, be given as the daily intake.

For the treatment of nephrosis, the same dictum holds true, only to greater extent. The urinary loss of albumin is usually considerably higher in nephrosis than in nephritis, and this must be replaced in the body, else depletion of the body stores leads to the conditions commonly associated with protein deficiency. Many interesting things relating to the deranged protein metabolism of nephrosis have been reported. Sudden falls occur in the protein level with the development of a nephrotic crisis, or the plasma-amino-acid content may rise abruptly with marked improvement in the patient's condition. The unpredictable trends in this disease require that the body protein stores be kept at the highest possible level in order to combat any relapse or take advantage of any improvement. The present trend in therapy of kidney disease is directed more at correcting the metabolic disturbances of the body, of which hypoproteinemia is most prominent, than at the pathologic change in the kidneys.

DISEASES OF THE LIVER

The liver is the organ of the body which is very much concerned with protein metabolism and is itself affected by the body-protein levels. It is the clearinghouse to which the digested protein, in the form of amino acids, must come for synthesis into the plasma proteins albumin, globulin, fibrinogen and prothrombin. Any significant amount of damage to the liver reduces its capacity to synthesize plasma protein. Conversely, an induced deficiency of body protein in animals has been found to produce fatty deterioration of the liver, which may progress to the state of permanent damage, as in liver cirrhosis.

For many years carbohydrate alone has been considered the one substance capable of providing protection for the liver cells. This is no longer true. Protein has now been shown to be considerably more effective in this respect. Experimental work indicates that the action of the protein is directed against the deposits of fat which appear in the liver as a result of damage to the liver cells. This effect can be ascribed directly to the action of the amino acids cystine and methionine. The latter is transformed in the body to choline, which has repeatedly been shown capable of protecting and restoring the liver cells. The fat content of the liver has been shown to vary inversely with the amount of protein supplied to the body.

The cause of liver cirrhosis has remained obscure, in spite of much work on the problem. Recently, however, observations strongly suggest that this disease is a deficiency state. The frequency with which cirrhosis is found in individuals known to be deficient in protein and in vitamins is striking. Chronic alcoholism alone has never been responsible for cirrhosis, but now the abnormal diets which commonly accompany alcoholism have been linked with the liver damage. The observation of Patek that cirrhotic patients in the Orient, where alcoholic consumption is negligible, almost universally have protein and vitamin deficiencies lends further support to the deficiency theory.

This relationship of diet to cirrhosis is demonstrated effectively by the beneficial results obtained through modern therapy, which takes cognizance of the dietary factors by supplying high levels of protein in addition to high carbohydrate vitamins and calories. As compared with earlier methods of treatment by means of high carbohydrate diets and removal of protein-containing transudates, much better results in a greater number of patients are now reported. In some cases actual improvement in liver function can be demonstrated.

The effect of protein on the liver is not only reparative but also definitely protective against the agents known to be toxic to the liver, such as chloroform, arsphenamine, and even the sulfa drugs. This action is also related to the methionine content of the protein. (See discussion of choline, pages 38 and 39.)

PEPTIC ULCER

A close correlation has been found between the development of peptic ulcer and the level of protein in the diet under experimental conditions. Ulcer lesions have been produced by administration of low protein diets to rats, in which case almost one half of the animals developed true ulcers after a three-month period. A high protein diet in rats gives protection against such ulcer-provoking regimens as alternate feeding and starvation and the administration of hydrochloric acid. A similar close relationship between the incidence of ulcer and protein intake in humans has not yet been demonstrated, but a rather high incidence of moderate hypoproteinemia in peptic-ulcer cases has been reported.

Co Tui has reported ninety-three cases of intractable peptic ulcers using the hyperalimentation method employing protein hydrolysates and dextrimaltose orally. He derived very encouraging results, although the time of observation from the standpoint of recurrence is still inadequate. Nevertheless, the high protein therapy justifies conservative consideration.

This may be a causal effect of inadequate dietary buffering of the strongly acid gastric secretion, or it may result from the insufficient quantities of protein supplied by the limited diets used in ulcer treatment. Large quantities of milk must be consumed in order to supply normal protein requirements, which in the ulcer patient are increased above normal in the healing stage. Any ulcer, be it peptic, infectious or the result of pressure and circulatory changes, represents a loss of tissue and requires protein for rebuilding. Its healing may actually be retarded by minimal degrees of edema. In the presence of an inadequate protein supply, all body needs must compete, and all may not be satisfied.

MISCELLANEOUS CONDITIONS NEEDING PROTEIN CONSIDERATION

There are other medical conditions in which too little attention is often given to maintaining proper levels of protein nutrition. In many of these, special dietary care is required and the protein quota should not be neglected. In old age, for instance, all too often the food intake deteriorates to soft foods of limited variety. Decreased amounts of hydrochloric acid in the stomach reduce the efficiency of protein digestion. Yet, in such instances, the same protein requirements for maintenance of the numerous body functions are still in effect.

In other situations the need for replacing the loss of abnormal quantities through one means or another should not be overlooked in planning the diet. An example of excessive alimentary loss of protein is seen in all types of chronic colitis, losses which must be replaced if the body is to be kept at high levels of efficiency. Protein may also be lost because of its excessive breakdown under he influence of fever or heightened body metabolism, and negative nitrogen balances may develop, as, for instance, in hyperthyroidism.

Numerous conditions are encountered n the field of surgery in which the maintenance of high protein levels has been found essential to the well-being of he patient. Any type of surgical procedure entails a certain amount of tissue destruction, which may be quite extenive. The actual loss of body protein as consequence of surgical manipulation s evident in postoperative urinary nitrogen losses, which have been found to be s much as from 10 to 26 Gm. daily, or more than 100 Gm. of nitrogen over a period of ten days. Additional loss of plasma protein and hemoglobin from emorrhage at the time of operation, oo, is inevitable.

In addition to these losses, many paents may be brought to operation with heir protein stores already seriously reduced as a result of the condition necessitating operation. When a malignancy or other gastro-intestinal disturbance exists, food intake has often been reduced because of loss of appetite or vomiting. There may be faulty intestinal absorption as well. In other situations, such as chronic infection, the prolonged fever in conjunction with copious drainage from an infected wound may reduce a patient's plasma protein to surprisingly low levels if careful attention is not given to replacement by dietary or other means. The combination of these factors is responsible for the reduction in the blood-protein levels found in nearly half a series of unselected surgical patients. More than half of the fatalities which occurred were in patients showing hypoproteinemia.

The course of the patient during operation and subsequently has been shown to be intimately related to the plasma-protein level and the protein reserves of the body. The development of surgical shock from acute blood loss or tissue manipulation is more prone to occur in an individual whose protein stores have been depleted prior to operation than in one with adequate reserves. Furthermore, the patient well fortified with protein supplies can withstand the lowering of blood-protein levels which may occur in progressive relationship to the duration of the anesthesia. Liver damage from anesthetics, always of concern to the surgeon, rarely occurs when this organ is well supplied with protein.

Recent work has confirmed earlier observations on the importance of an adequate protein supply as one of the factors affecting wound healing. It has now been shown that connective-tissue growth proceeds more rapidly when high protein diets are fed. As a result, the maximum strength of a wound is reached more rapidly when liberal protein is supplied. In these circumstances, cellular proliferation is stimulated and accelerated. At the other extreme, when the factors disposing to hypoproteinemia have not been combated and edema is present, wound disruption is not unusual. Patients who undergo operation for cancer of the gastro-intestinal tract or other lesions of the stomach, in which dietary habits are commonly upset, show a high incidence of wounds with retarded healing or deep infection. Experimentally, the condition of such wounds can be improved rapidly by administration of plasma transfusions.

In other ways the postoperative course of protein-deficient patients may be impeded. The pulmonary edema which sometimes accompanies low blood-protein levels predisposes to pneumonia. Less specifically, the prolonged weakness following operation is attributed by some observers to lowered levels of body protein.

The adequate treatment of patients suffering from burns is very dependent on maintenance of proper protein levels in the blood. During the acute stages of extensive burns, protein must be supplied primarily by the intravenous route. However, this means of administration should be augmented as soon as possible by high levels of dietary protein. Only in this way is it possible to overcome the great losses of plasma protein from burned surfaces and tissue loss as a result of toxic destruction and probable liver damage. A continued supply of large amounts of protein is necessary to provide for repair and new growth in the burned area, as well as for maintaining the body's resistance against the ever-present danger of overwhelming infection.

The importance of maintaining surgical patients at high levels of protein nutrition is being demonstrated repeatedly. If the protein stores are depleted prior to operation, these should be restored if time permits. Careful attention to maintenance of normal or even high levels of protein during and after operation will result in a smoother and happier course for the patient and an overall reduction in mortality. These factors justify the consideration of both the oral and the intravenous use of amino acids as protein nourishment.

AMINO ACIDS AS PROTEIN NOURISHMENT

Amino acids represent the basic elements of all protein, including protein food. It should be emphasized that not only do amino acids represent the basic nutritional elements of all protein but they circulate freely in the blood, in which they maintain a constant concentration similar to that of glucose. They are to proteins what glucose is to starch. Their discovery, purification and identification mark one of the milestones in the development of the science of nutrition, which has made such great strides by isolating from the complex mixtures of foods the specific chemical components that take part in the metabolic activities of the body. Amino acids differ from vitamins in that they are more than catalysts or enzymes and actually enter into the structure of the body tissues. Because of this, they are often called the building stones of protein. While they are thus consumed like glucose, unlike glucose they are not primarily burned as fuel, except under special conditions. They also differ from other basic food elements in that there are so many of them. The single molecule of glucose represents the pure form in which carbohydrate is utilized. Even the vitamin B complex has been reduced to a series of single, crystalline substances. On the other hand, amino acids are twenty-one or more in number and are made up of both essential and nonessential amino acids, as discussed in the chapter on diet in health, page 7.

Apparently the first successful clinical use of hydrolyzed protein was described in 1904 by Friedrich. No further reports of this promising work appeared until 1913, when the first successful experiment was described by Henriques and Anderson, who kept a goat alive for sixteen days in positive nitrogen balance with a continual intravenous drip containing glucose, salts and an enzymic hydrolysate of meat.

The subject of intravenous alimentation did not again appear in the literature for two decades, except for the statement made by Woodyatt in 1915 that intravenous nutrition with glucose had been proved to be a possible clinical proposition, and that the way was open for experiments with amino acids, polypeptids, etc. In 1934, Rose stated in the summary of his work on the nutritional significance of amino acids that it was not wholly improbable that methods might be devised whereby this ideal mixture of amino acids could be employed for parenteral administration to human subjects when the prevention of undue loss of body structure was an important consideration.

The oral administration of amino acids is indicated in cases of protein depletion when it is necessary to overcome difficulties in digestion or it is desirable to introduce great amounts of protein therapeutically for absorption. The oral administration of amino acids of course implies the absence of interference with the absorption of fluid from the gastrointestinal tract. The oral use of protein hydrolysates is of value in that they may be given in smaller bulk than a corresponding amount of natural food, and for this reason more of the former than of the latter can be given. Being of uniform composition, it is easier to calculate the intake, and it is easily dispensed. Given in the capacity of a drug, it circumvents the whims of appetite and the difficulty of getting the patient to take a high protein diet. Palatable mixtures that yield 25 Gm. of protein to the ounce are available.

There is a great variety of clinical conditions in which the parenteral alimentation of the amino acids is of great value. First, when the patient cannot ingest any food at all because of an actual anatomic obstruction, or because vomiting follows the ingestion of food. Second, when conditions exist in which the patient cannot digest or absorb food protein because of hypermotility, infections, absence of proteolytic ferments and so on. Third, in conditions in which the patient cannot take food without deleterious effects, even though the digestive process is normal—such cases in which the physician desires to put the gastro-intestinal tract completely at rest without inducing or aggravating protein depletion from starvation. And fourth, conditions in which the patient cannot ingest and assimilate adequate protein normally because of an anorexia or limitation in the digestive or absorptive capabilities from the intestines. From these indications, many patients coming to surgery need preoperative management with amino-acid solutions, and we believe there is justification for the wide use of amino-acid preparations in surgical patients.

There are still shortcomings in amino-acid therapy, either orally or intravenously, but these we anticipate will be overcome by the biochemists.

In the postoperative period of management there likewise is need for the discriminate use of amino-acid therapy, but there would probably be less need for amino-acid therapy if every effort were made to mobilize the patient early after operation. If patients can be got out of bed by the third or the fourth day and given adequate, appetizing diets, there will in the main be little need for amino-acid therapy. The goal should be to get patients early out of bed and early out of the hospital. The author might add, for what it is worth, that he is firmly convinced of the need for a revolution in the preparation and the serving of food to hospital patients. It is obvious that if properly selected and prepared foods can be taken by mouth, there will be little need of amino-acid therapy. It is hoped that the biochemists, the physiologists and the clinicians will not make a fad out of the important, discriminate use of amino-acid therapy, as was done in the early stages of vitamin therapy. Many patients have a real need of high protein intake, by diet therapy or by the discriminate use of amino-acid therapy, either by oral administration or by parenteral alimentation.

Studies in the field of protein metabolism and its application to disease are progressing rapidly. The significance of protein substance to many essential body mechanisms has been pointed out. Without doubt other functions of it and its relationships to disease states will be revealed, such as the action of the protein molecule as a whole or the effect of any of its specific components, the amino acids. There is a definite trend toward thinking of protein in terms of amino acids, since the protein molecule loses its entity when it enters the body and is split into amino acids.

There are many opportunities for practical dietary applications of the advances in our understanding of protein economy. The provision of liberal protein diets in instances in which the value of protein has been demonstrated offers the patient both prophylactic and therapeutic advantages.

Chronic Arthritis

Although a vitamin deficiency may produce in man some symptoms that simulate to some extent those occurring in rheumatic diseases, the clinical picture of the arthritides as a whole is quite different. More conclusive evidence must be forthcoming before the hypothesis can be accepted that these diseases result from a streptococcal infection superimposed on a vitamin C deficiency.

In rheumatoid arthritis there may be a deficiency of certain vitamins: the serum may be low in vitamins A and C; a deficiency of vitamin B is also probable but has not yet been demonstrated. These deficiencies are common to various rheumatic diseases, they are not specific or striking, and their significance is not at all clear. Vitamin A has been prescribed by some; vitamins B_1 and B_2 as adjunct therapy by others. The working hypothesis behind Reed's use of massive doses of vitamin D in arthritis is that there may be an obscure disturbance in calcium metabolism which vitamin D somehow stabilizes. The use of all the preparations of concentrated vitamin D for arthritis was inferentially frowned on by the Council of Pharmacy and Chemistry. It found no scientific evidence to support the claims made and deprecated the unwarranted exploitation of concentrates of vitamin D. The report of Abrams and Bauer concludes that the use of massive doses of vitamin D in rheumatoid arthritis is of little or no value.

DIETARY TREATMENT IN RHEUMATOID ARTHRITIS

Pemberton has suggested the following factors in the dietary program in rheumatoid arthritis:

1. Calories: To meet individual energy requirements
2. Protein: About 1 Gm. per Kg. of body weight (about 15 per cent of calories needed)
3. Carbohydrates: To supply from 33 to 50 per cent of calories needed
4. Fats: To supply from 50 to 33 per cent of calories needed
5. Vitamins and minerals: In abundance

Haden approved a diet low in carbohydrates with adequate vitamins and vitamin supplements (wheat germ and yeast) and abundant proteins. Cmunt noted no beneficial results from the use of a low carbohydrate diet in cases of chronic rheumatism and deforming arthritis. Others insist that there is no such thing as a specific diet for arthritic patients and no need to avoid meats or citrus fruits. Anything that will agree with the patient should be permitted freely.

Thus it is seen that various results have been reported, both from the use of specific vitamins and different types of special diets, in the treatment of arthritis. However, no consistently successful results have been obtained to justify the routine use of any one of these diets or vitamins. Certain varieties of foods, such as sweets, meats and fruits, have been thought to be contraindicated in arthritis. It is probable that certain cases considered to be arthritis, in which there was an apparent benefit, were confused with what is now considered to be gout.

Cecil and Archer have suggested that the most important part of the treatment of menopausal arthritis is reduction of the patient's weight. Reduction of weight in cases of either rheumatoid arthritis or osteo-arthritis with an associated obesity is probably a very important part in the treatment.

The current opinion of most outstanding rheumatologists is that aside from gout there is no diet for any form of arthritis but that there may be a certain type of diet needed for the patient with arthritis. For example, one anemic rheumatoid-arthritic patient who perhaps has lost considerable weight will need a high caloric, high vitamin, high iron anticonstipation diet, whereas another rheumatoid-arthritic patient who is obese and therefore traumatizing his weight-bearing joints so that obesity must be considered a major factor should have a weight-reduction diet to produce a significant weight loss. A weight-reduction diet is especially indicated in the obese osteo-arthritic patient.

Probably the best results will be obtained in the management of chronic arthritis from carefully planned clinical therapy rather than from any specific vitamin or special dietary procedure. The physician will follow procedures that have been proved to be of value. He will take into consideration the management of foci of infection and the use of vaccines, antigens, filtrates, certain proven drugs, perhaps gold salts, and physiotherapy. The diet that should be used should follow the diet in health outlined on pages 58 and 59 altered only to meet the individual's associated problems.

Pregnancy and Lactation

Pregnancy and lactation are normal physiologic functions, and the diet in health outlined on pages 58 and 59, with the addition of one pint of milk and moderation in the use of starches and sugars, is a sound regimen.

It has been shown that after the third month of pregnancy the metabolic rate gradually increases. This naturally requires an increased caloric intake. The normal increase in appetite which is generally noted at this time will usually take care of this need. Care should be taken if any excessive overnutrition develops, and in many instances a curtailment in the food intake in proportion to the appetite is necessary.

Protein intake should be liberal because of the need of new tissue building. This will be met ordinarily by the inclusion of at least one quart of milk daily. Milk is the important food item, both because of its high calcium content and its protein value.

Constipation is often an accompaniment of pregnancy, especially during the later months. This should be controlled readily by increasing the intake of fruits and vegetables.

NAUSEA OF PREGNANCY

Nausea of pregnancy has been attributed to many factors ordinarily having very little to do with food. Certain authorities claim there is some disturbance of the carbohydrate metabolism.

Dietary Measures in Pregnancy

Simple dietary measures such as the following often yield good results:

1. Cup of hot coffee with sugar, dry toast or cracker on awakening in the morning and before arising.
2. Avoidance of odors of cooked foods.
3. Small and frequent feedings.
4. High carbohydrate foods.
5. Use of dry foods, such as toast, broiled chops or steak, sliced chicken or crackers.

ECLAMPSIA

A disturbed carbohydrate metabolism has been emphasized by some as a factor in eclampsia. Until the cause is more clearly demonstrated, the following of a normal dietary regimen during pregnancy will be the best safeguard against its development.

Ketogenic Diet

Nature of Diet

Ketogenic factors or fatty-acid derivatives overbalance the antiketogenic factors or glucose derivatives of food

Object of Diet

To produce ketosis (acetone, diacetic acid and beta-oxybutyric acid in urine)

The ketogenic diet consists of a large amount of fat, an adequate amount of protein and a minimum amount of carbohydrate. Ketone bodies (acetone, diacetic acid and beta-oxybutyric acid) are formed and excreted in the urine as the intermediary products of the incomplete oxidation of fats when the amount of carbohydrate in the diet is limited. This condition is spoken of as ketosis. In other words, the ketogenic factors or fatty-acid derivatives of foods overbalance the antiketogenic factors or glucose derivatives of food.

Much prominence has been given to the ketogenic diet in the treatment of epilepsy, particularly in children, and in the treatment of urinary infections. While this diet is still used in certain cases of epilepsy in children and in adults, the author feels that the present status of the ketogenic diet is not that of a specific therapeutic measure or cure, but rather that of a diet that has served its important mission in the evolution of the treatment of urinary infections by leading the way to the discovery of the bacteriostatic factor, beta-oxybutyric acid, which, in turn, leads to mandelic acid. In addition, it has been used with enough success for sufficient length of time to justify its use as one of the methods of treating idiopathic epilepsy.

IMPORTANT FACTORS IN THE USE OF THE KETOGENIC DIET

1. Large amounts of fat
2. Minimal amounts of carbohydrate
3. Adequate protein content
4. Gradual development and maintenance of ketosis
5. Method of calculating and maintaining the diet
6. Education of patient
7. Guarding against any deficiency in diet

The important factors in dietary treatment outlined above need further discussion.

Fat: Large Amounts. Large amounts of fats are obviously a need, and skill in their use will go a long way in making the diet palatable. Forty per cent cream should be used rather than 10 or 20. Many desserts containing whipped cream and nuts or various forms of frozen mousse are very palatable. Many vegetables, as well as soups, can be served with rich cream. Cream cheese and American cheese are desirable. Butter may be added to vegetables, soups and meats; in fact, butter can be used in large quantities without difficulty. Bacon and fatty meats offer further means of incorporating more fat, as well as egg yolks and various oils in salad dressings.

Carbohydrate: Minimal Amounts. Minimal amounts of carbohydrate are allowed in order to develop or intensify the ketosis. As with diabetic patients, patients using the ketogenic diet must learn to do without sweets and starches. It is necessary to use bread substitutes, such as bran soy muffins, bran wafers and soybean wafers in place of breads. Saccharin may be used instead of sugar. Many foodstuffs canned without sugar, as prepared for the use of those with diabetes mellitus, are valuable in planning the diet. Three-per-cent rather than 6-per-cent vegetables should be used in order to help avoid the sensation of hunger resulting from lack of bulk.

Protein: Adequate. Adequate protein is especially necessary in the use of the ketogenic diet, because ketosis taxes the protein molecule for its antiketogenic fraction. It is best to use from one third to one half of the body weight in pounds as the number of grams of protein for the adult, while for the child we suggest two thirds of the body weight in pounds. We have calculated the diets presented on the basis of 1 Gm. of protein per Kg. of body weight. This represents, in number of grams, a little less than one half of the body weight in pounds. The amount of protein necessary in the effort to maintain nitrogen equilibrium and avoid protein starvation depends on the age of the individual and the degree of ketosis produced.

Gradual Development and Maintenance of Ketosis. The gradual development and maintenance of ketosis are very important. Occasionally the sudden change from the normal diet, relatively low in fat and high in carbohydrate, on which the average patient now lives, to a diet that is low in carbohydrate and high in fat may result in nausea or even vomiting. There will be little difficulty if the change is made gradually or if the patient fasts for two or three days and then is placed on a diet to maintain ketosis. With the development of ketosis and the increased excretion of base, some loss of weight may be expected because of the accompanying dehydration. In applying the ketogenic diet and observing the results, emphasis should be placed on the variability in the absorption and the assimilation of a high intake of fat by different persons, as well as on fluctuations in the degree of ketosis.

Method of Calculating and Maintaining the Diet. One of the conditions necessary to the utilization of the ketogenic diet is a method of calculating the diet and maintaining it when calculated. The calculation of a ketogenic diet depends on two principles: first, the total amount of food given must correspond as closely as possible with the total energy requirements of the patient, and, second, the ketosis produced by the use of large amounts of fat with limitation of the quota of carbohydrate must be developed and maintained. During the author's experience with the ketogenic diet he developed a method (p. 623) which, although less exact from the standpoint of the theoretic relationship involved, was sufficiently accurate for clinical work and had the advantage of greater simplicity. The resulting diets conform to the theoretic causes of ketosis as developed by Woodyatt and Shaffer. The fact that large amounts of acetone and diacetic acid are excreted in the urine after the proper administration of a ketogenic diet provides a simple means for the physician or patient of testing for the presence of these ketone bodies. (See page 730.)

Education of Patient. The most important part of the treatment is the education of the patient. While the diet is being adjusted, he learns how to test for acetone bodies in the urine, how to use a set of scales, how to use food tables and how to translate grams of carbohydrate, protein and fat into meals in terms of vegetables, fruits, eggs and other foodstuffs. This at first seems difficult, but it has been our experience that even patients who have had only limited educational advantages can be trained to take care of themselves.

Guarding Against Any Deficiency in Diet. Since the ketogenic diet may be continued for a long period of time, it is extremely important to guard against the possible evil effects of any kind of deficiency in the diet. Adequate calories, protein, minerals and vitamins must be provided to maintain health in the adult and meet the needs for growth in the child.

There is a tendency for the calcium and the phosphorus in the ketogenic diet to be inadequate. There may be need of incorporating calcium and phosphorus. Because of the possible lack of adequate vitamin B in the diet, it may be necessary to incorporate, as routine, from one half to one teaspoonful of Brewer's yeast daily. Evans has reported that excess of certain fats exerts a sparing action on vitamin B.

The author observed, early in the use of the diet, that about 30 per cent of the women treated ceased to menstruate. It has been shown that there is definite inhibition of the estrual cycle in rats who are on diets deficient in vitamin B. As a result of these observations and since we have used brewer's yeast, we have not had one case of cessation of menstruation of women on the ketogenic diet.

THE USE OF THE KETOGENIC DIET

The ketogenic diet has been used in the treatment of:

1. Epilepsy
2. Migraine
3. Asthma
4. Chronic urinary infections

Epilepsy

Originally the beneficial effects of the ketogenic diet were thought by Wilder to be due to the influence of aceto-acetic acid, which behaves pharmacologically as an anesthetic. Keith's experimental evidence, observing the effect of aceto-acetic acid on the convulsions induced by thujone, supports this hypothesis. It has also been suggested that the beneficial effects of the ketogenic diet are due to its effect on development of alkalosis. It probably has an even more fundamental influence on the balance of the basic elements of the nervous tissue, namely, water and fat, and by some physiochemical reaction it may alter conductivity, irritability and permeability of the nerve cell. Lennox and Cobb in their comprehensive monograph presented many physiologic factors that might precipitate seizures by widespread changes in tissues of the brain. Such factors are anoxemia, alkalosis or edema.

Fay, and later McQuarrie, called attention to the possible influence of fluid and its control in the treatment of epilepsy. It is their belief that the therapeutic benefit of the ketogenic diet is due to the dehydration effect. Byron was unable to support the dehydration theory. Keith found little influence by extreme dehydration in preventing experimentally produced convulsions.

Bridge and Iob have presented evidence that neither the ketosis nor the acidosis accompanying the so-called ketogenic treatment for epilepsy can be considered the only beneficial factors of such a regimen. Knowing that sodium represents almost all the base of the extracellular fluids of the body, whereas potassium is the chief base of the tissues, it was possible for them to calculate with a fair degree of accuracy the source of the fluid which was lost when the patient was on the diet. Their experiments suggest that if the high fat diet has succeeded in removing a surplus of extracellular tissues from the body, improvement in seizures results. If the diet has not removed this fluid, it does not affect the course of the disease.

All three measures that have been brought forth recently—fasting, the ketogenic diet and rigid restriction in intake of fluid in the treatment of epilepsy—have in common the effect of causing dehydration of the tissues and a tendency to maintain the hydrogen-ion concentration of the body fluids at a slightly higher level than normally exists. Dehydration alone produces a shift in the acid-base balance so that the tendency is to greater acidity of the tissues. This intimate relationship of the acid-base balance and the water balance makes it difficult to ascertain which is of primary importance so far as the occurrence of seizures is concerned.

The ketogenic diet was first used in epilepsy in 1921. The results of treatment by the ketogenic diet in epilepsy since this time show that the symptoms of about 30 to 35 per cent of the patients who follow the diet carefully and accurately for a period of six months to a year are controlled; the condition of another 35 to 40 per cent of the patients is definitely improved; about 30 to 40 per cent of the patients derive no benefit. There seems to be no question but that the best results are obtained in the treatment of children and young adults who are just beginning to have seizures before the convulsive reaction has become a habit. Older patients, or those who have had frequent attacks for years, especially with resultant mental deterioration, are the least likely to be benefited.

The author feels that an adequate period of observation has elapsed to judge the effects of diet alone in cases of epilepsy, and that now it is possible to judge approximately the results that can be expected. Probably the best regimen for the patient who has epilepsy today should incorporate (1) the drug of choice, phenobarbital (luminal), or dilantin; (2) the ketogenic diet, employed either from the qualitative or the quantitative standpoint as the case may necessitate; and (3) restriction of the intake of fluid to within 20 ounces (600 cc.) every twenty-hour hours.

MIGRAINE

Early in the author's experience with the ketogenic diet he tried it in the treatment of migraine because so many physicians had noticed the close relationship between epilepsy and migraine. Certain observers believe that these conditions are due to the same etiologic factors expressed in a different manner; namely, that attacks of migraine are a sensory seizure, whereas epilepsy is a motor seizure. However, there are very few cases in which epilepsy coincides with migraine. Migraine is a rather common syndrome and it is not surprising that a certain number of patients who have epilepsy should also have migraine.

Since we made the first report, from the Mayo Clinic, Schnabel has reported his experience with the ketogenic diet in cases of migraine. It has been suggested that change in the acid-base equilibrium is a factor associated with migraine, since patients with this condition are benefited by fasting with its accompanying acidosis of starvation. Weissman - Netter found apparent changes in the acid-base balance in migraine: the hydrogen-ion concentration and alkaline reserve were normal in the periods of freedom from attacks but a tendency to alkalosis developed about forty-eight hours prior to an attack. The recent method of studying acid-base equilibrium by hyperpnea or overventilation of the lung, which induces alkalosis, was utilized by Muck, who produced hemicranial attacks by this means in cases in which patients were subject to migraine.

Many physicians have considered migraine from the standpoint of allergic manifestation. They have advocated various forms of treatment from the use of peptone and restriction of the intake of protein to the use of so-called elimination diets. Many patients themselves restrict the intake of carbohydrates, protein or fats when they find that overindulgence in one of the three elements of foodstuffs is followed by a sick headache. Of these three, overindulgence in carbohydrates is the most likely to precipitate an attack.

Another theory takes account of dysfunction of the liver and the duodenum. The French especially refer to duodenal migraine. Attention has been called to the evidence of disturbed hepatic function in cases of migraine as estimated by the van den Bergh reaction and retention of bilirubin. The condition of many patients has been improved by intraduodenal administration of magnesium sulfate to stimulate the flow of bile. With these facts in mind it can readily be seen that the use of the ketogenic diet in migraine is not without logic, for it potentially could meet, in a therapeutic manner, all three of the foregoing suggestions at the same time. If alkalosis induces migraine, the ketogenic diet, which produces ketosis with accompanying decrease in the irritability of the nerves, might be an additional factor which would inhibit attacks. From the standpoint of an allergic manifestation, it is possible that there is a chance withdrawal of the specific protein element, since the content of protein in the diet may be low. Intake of carbohydrate of course is markedly restricted. Boyden has shown that a diet in fat promotes biliary drainage, and it has been demonstrated also that duodenal motility occurs after ingestion of fat. Therefore, we would expect to benefit cases due to dysfunction of the liver or the duodenum.

For many years we have used the ketogenic diet quantitatively in the unusually severe and frequent attacks of migraine. In at least 30 per cent of these cases the migraine has been controlled; in 50 per cent the frequency and the severity of the attacks have been definitely lessened; and in about 20 per cent there has not been any improvement.

In cases of migraine in which the attacks have been less frequent and less severe, or in which the economic situation and the environment have prevented accurate application of the regimen, we have met with some degree of success by using a rough approximation to the ketogenic diet qualitatively.

ASTHMA

Tiefensee has advocated acid diet for bronchial asthma. In Peshkin's and Fineman's studies of the effects of the ketogenic diet on asthma of children, they chose cases of chronic asthma which proved refractory to various modern forms of treatment. The diet alone was efficacious in these cases to the extent that the chronic asthmatic state usually was controlled or entirely cured—at least long enough to permit the patients to become oriented. The control of asthma or the relief from it following the treatment with a ketogenic diet exclusively is possibly brought about by some mechanism which involves the physiochemical change in the cell and the blood of the patient, thereby restoring the allergic balance partially or completely. Beckman has called attention to the possible association of allergy and acid-base balance. M. Julesz studied the effects of the ketogenic diet on bronchial asthma. We have seen definite improvement in a few cases of asthma in adults, although justification for its general use is very questionable.

CHRONIC URINARY INFECTIONS

In reviewing the literature we find that many attempts have been made to free the urinary tract of the colon-bacillus infection. Efforts to change the urine from alkaline to acid reaction and vice versa have been made in the hope that in the changed medium the growth of the organism will be inhibited. However, it is doubtful if the urine in such procedures ever is free of the living organism.

From the work done by Schohl and Janney it is known that the colon bacillus is inhibited if the acidity or the alkalinity of urine is increased beyond a certain point (pH 4.6 to 5, acid, and at a pH 9.2 to 9.6, alkaline). The optimal growth of the bacilli takes place at pH 6 to 7. This is the average reaction of the urine of a person who is on a mixed diet. In a series of experiments on the relationship of the pH of the culture medium and the growth of the colon bacillus, it has been found that the urine may become free of organisms as determined by culture (at a higher pH than 4.6 to 5) when the pH drops below about 5.6, probably because the urine is a highly buffered medium.

In searching still further for means of acidifying the urine and inhibiting the growth of the colon bacillus, the author suggested the use of the ketogenic diet. Since then several reports have been made calling attention to the curative effect of this diet on infections of the urinary tract. A. L. Clark found and reported favorable results in those suffering from recurrent bacilluria of the bacillus coli type. Within seven to thirty-five days from the beginning of the ketogenic diet, these cases were free from bacteria and pus in the urine and in growth on culture. Helmholz, because of his wide experience from former therapeutic results, felt that urinary infection in the presence of anomalies could not be cleared up by any form of medical treatment, yet the first two cases of urinary infection with anomalies of the urinary tract not benefited from any other procedure of therapy were rapidly cured by means of the ketogenic diet. Hugh Cabot has discussed the treatment of infections of the urinary tract by the ketogenic diet and called attention to its possible value in the preparation of patients for operation on the urinary tract, as well as in their postoperative treatment.

Helmholz has shown that acidity of the urine alone or in combination with diacetic acid apparently is not responsible for the bactericidal effect, but that some other substance or substances in the ketonurine from a properly administered ketogenic diet act antiseptically at a pH below 5.6. The importance of a low pH should be emphasized in applying the ketogenic diet to urinary infection, since it has been demonstrated that urine showing a strongly positive reaction for diacetic acid after using the diet is not bactericidal if the pH of the urine is 5.6 or above.

A. T. Fuller, from his studies of the nature of the bactericidal agent, has reached the conclusion that the principal factor inhibiting the growth of the bacteria in the urine of patients receiving the ketogenic diet is the laevorotatory B-oxybutyric acid. Fuller's findings support the results of the work of Helmholz and Clark with regard to the importance of a low pH in the effectiveness of the ketogenic-diet treatment, and show that unlike most antiseptics the laevorotatory B-oxybutyric acid is likely to have better bacteriostatic action in vivo than in vitro, because of the continual excretion of an acid urine.

Osterberg and Helmholz have given a simple procedure whereby the clinician can determine easily whether or not ketonurine has reached the point of bactericidal action.

There is a variability in different persons in the absorption and the assimilation of a high intake of fat, as well as fluctuations in the degree of ketosis. Because of this fact, when one cannot get the pH below 5.6, it may be necessary to combine with the ketogenic diet ammonium nitrate or ammonium chloride, given orally, to increase the acidity of the urine. The ketogenic diet can be planned so that the average patient will develop an intense ketosis in a few days, and in most instances the pH will fall well below 5.6. Most cases that are benefited will respond to the ketogenic diet within a comparatively short time.

DIRECTIONS FOR APPLICATION OF DIETS

It is our desire that each individual case should have a series of diets calculated according to the method presented on page 623. This may not be possible in every circumstance; therefore, we are presenting three series of diets calculated on the basis of body weights.

We have used as an example in Series 1 a patient weighing 110 pounds, or 50 Kg.; in Series 2 a patient weighing 140 pounds, or 63 Kg.; and in Series 3 a patient weighing 170 pounds, or 76 Kg. These diets have all been calculated according to the method presented on page 623. In each instance we have used 1 Gm. of protein per Kg. of body weight, which is a little less than one half of the weight in pounds.

Five diets are calculated for each series because of the desire to develop ketosis gradually and thus avoid some of the unpleasant reactions to an abrupt change in food habits as previously discussed.

If the patient fasts for two or three days prior to starting the ketogenic diet, he may be placed immediately on Diet 3 or Diet 4 of any series chosen. The series that one decides to use depends on the normal body weight of the individual to be treated.

Any one of the three series of diets presented may be made applicable for any case by means of a slight variation in the protein or fat content or both. The substitutions necessary for protein or fat alterations are discussed on pages 81 and 82.

The approximate average mineral content for Diet 4 of these series of diets is:

Calcium	.485
Phosphorus	.745
Iron	.0105

Simple Qualitative Restriction

Typical Foods Allowed in the Ketogenic Diet:

Bran soy muffins
Soybean wafers
Fats: butter, bacon fat, salad oils, etc.
Cream
Meat
Bacon
Egg
Vegetables:
  3% in large amounts
  6% in limited amounts
Fruits: 5% and 10% in limited amounts

Typical Foods Avoided in the Ketogenic Diet:

Cereals and breadstuffs
Milk
Vegetables:
  15% and 20%, such as pea, corn and potato
Fruits:
  15% and 20%
  Cooked with sugar
  Dried
Sweets: sugar, jelly, jam, honey, candy, chewing gum, etc.
Pastry: pie, cake, ice cream

A FEW SUGGESTED SUBSTITUTIONS FOR THE KETOGENIC DIETS

In place of 25 Gm. of bran soy bread, one muffin, substitute one of the following:

1.	Soybean wafer	2 wafers	
	Butter	5 Gm.	
2.	Cream, 40%	25 Gm.	
	Jello without sugar	100 Gm.	1 serving
3.	Vegetable, 3%	30 Gm.	
	Jello without sugar	100 Gm.	1 serving
	Cream, 40%	25 Gm.	

In place of 50 Gm. bran soy bread, two muffins, substitute one of the following:

1.	Vegetables, 3%	50 Gm.
	Butter	15 Gm.
	Soybean wafer	3 wafers
2.	Vegetable, 3%	50 Gm.
	Butter	15 Gm.
	Egg	1
3.	Cream, 40%	30 Gm.
	Egg	1

In place of 75 Gm. bran soy bread, three muffins, substitute one of the following:

1.	Vegetable, 3%	50 Gm.	
	Cream, 40%	50 Gm.	
	Egg	1	
2.	Vegetable, 3%	100 Gm.	
	Butter	25 Gm.	
	Egg	1	
	Jello without sugar	100 Gm.	1 serving
3.	Cottage cheese	40 Gm.	
	Cream, 40%	50 Gm.	
	Butter	10 Gm.	
4.	American cheese	20 Gm.	
	Vegetable, 3%	50 Gm.	
	Cream, 40%	50 Gm.	
	Jello without sugar	100 Gm.	1 serving

In place of 15 Gm. salad dressing made with oil, substitute:

Butter	15 Gm.

In place of one egg, substitute one of the following:

1.	Meat	25 Gm.
2	Liver	30 Gm.
	Butter	5 Gm.
3.	Fish, other than salmon	30 Gm.
	Butter	5 Gm.
4.	Salmon	30 Gm.
5.	Shrimp	25 Gm.
	Butter	5 Gm.
6.	Crabmeat	40 Gm.
	Butter	5 Gm.
7.	Lobster	35 Gm.
	Butter	5 Gm.
8.	Sardines	30 Gm.
9.	Dried beef	20 Gm.
	Butter	5 Gm.
10.	Cheese, solid	20 Gm.

In place of 100 Gm. of 6 per cent vegetable, substitute one of the following:

1. Vegetable, 3%	100 Gm.
2. Fruit, 5%	120 Gm.

In place of 100 Gm. of 10 per cent fruit, substitute one of the following:

1. Fruit, 5%	200 Gm.
2. Vegetable, 3%	300 Gm.
3. Vegetable, 6%	175 Gm.

METHOD OF CALCULATION FOR KETOGENIC DIET

Diet	Carbohydrate, Gm.	Protein, Gm.	Fat, Gm.	Procedure
1	Estimated calories* × 0.035	Adult—⅓ to ½ weight† Child—⅔ weight	Estimated calories × 0.09	Continue two to three days or fast patient for two days and begin with Diet 3
2	Estimated calories × 0.02	Adult—⅓ to ½ weight Child—⅔ weight	Estimated calories × 0.09	Continue one to two days. Intermediate diet prior to production of ketosis
3	Estimated calories × 0.015	Adult—⅓ to ½ weight Child—⅔ weight	Estimated calories × 0.10	Continue three to five days, ketosis may develop
4	Estimated calories × 0.010	Adult—⅓ to ½ weight Child—⅔ weight	Estimated calories × 0.10	
5	Estimated calories × 0.008	Adult—⅓ to ½ weight Child—⅔ weight	Estimated calories × 0.10	Continue indefinitely. Diets 3 or 4 to be used in order to develop or intensify ketosis if necessary

* Total estimated calories equals weight in pounds × 16 for adults; total estimated calories equals weight in pounds × 25 for children.

† Protein quota ⅓ to ½ weight in pounds is determined by patient's individual needs; one Gm. of protein per Kg. of body weight is a little less than ½ the body weight in pounds.

SERIES 1 (WEIGHT 110 LBS.)

Diet 1

62 Gm. Carbohydrate
1,870 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 62, Protein 50, Fat 158, Calories 1,870

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread (whole-wheat)	20	1 thin slice
Butter	60	6 squares
Salad dressing with oil	15	1 tablespoon
Milk	100	½ glass
Cream, 40%	150	¾ glass
Meat (lean)	75	1 serving (2½ oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3%	400	4 servings (2 cups)
Vegetables, 6%		
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 1 (WEIGHT 110 LBS.)

Diet 1

62 Gm. Carbohydrate
1,870 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	3 slices	15
Egg	1	50
Bread (whole-wheat)	1 thin slice	20
Butter	2 squares	20
Cream, 40%	¼ glass	50
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Egg (or egg substitute)	1	50
Vegetable, 3%	2 servings	200
Butter	2 squares	20
Cream, 40%	¼ glass	50
Fruit, 10%	1 serving	100
DINNER		
Meat	1 serving	75
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	1 tablespoon	15
Butter	2 squares	20
Cream, 40%	¼ glass	50
Milk	½ glass	100
Fruit, 10%	1 serving	100

SERIES 1 (WEIGHT 110 LBS.)

Diet 2

35 Gm. Carbohydrate
1,762 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 35, Protein 50, Fat 158, Calories 1,762

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	75	3
Butter	50	5 squares
Salad dressing with oil		
Milk		
Cream, 40%	150	¾ glass
Meat (lean)	75	1 serving (2½ oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3%	300	4 small servings (1½ cups)
Vegetables, 6%		
Fruit, 5%	200	2 servings
Fruit, 10%	100	1 serving
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 1 (WEIGHT 110 LBS.)

Diet 2

35 Gm. Carbohydrate
1,762 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
	BREAKFAST	
Fruit, 10%	1 serving	100
Bacon	2 slices	10
Egg	1	50
Bran soy muffin	1	25
Butter	1 square	10
Cream, 40%	¼ glass	50
Beverage—coffee, tea or coffee substitute		
	LUNCHEON	
Egg (or egg substitute)	1	50
Vegetables, 3%	2 small servings	150
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ glass	50
Fruit, 5%	1 serving	100
	DINNER	
Meat	1 serving	75
Vegetables, 3%	2 small servings	150
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ glass	50
Fruit, 5%	1 serving	100

SERIES 1 (WEIGHT 110 LBS.)

Diet 3

26 Gm. Carbohydrate
1,888 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 26, Protein 50, Fat 176, Calories 1,888

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	75	3
Butter	55	5½ squares
Salad dressing with oil	15	1 tablespoon
Milk		
Cream, 40%	150	¾ glass
Meat (lean)	75	1 serving (2½ oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3%	300	4 small servings (1½ cups)
Vegetables, 6%		
Fruit, 5%	200	2 servings
Fruit, 10%		
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 1 (WEIGHT 110 LBS.)

Diet 3

26 Gm. Carbohydrate
1,888 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

	BREAKFAST	
		Gm.
Fruit, 5%	1 serving	100
Bacon	2 slices	10
Egg	1	50
Bran soy muffin	1	25
Butter	1½ squares	15
Cream, 40%	¼ glass	50
Beverage—coffee, tea or coffee substitute		
	LUNCHEON	
Egg (or egg substitute)	1	50
Vegetables, 3%	2 small servings	150
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ glass	50
Fruit, 5%	½ serving	50
	DINNER	
Meat	1 serving	75
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ glass	50
Fruit, 5%	½ serving	50

SERIES 1 (WEIGHT 110 LBS.)

Diet 4

18 Gm. Carbohydrate
1,856 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 18, Protein 50, Fat 176, Calories 1,856

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	75	3
Butter	55	5½ squares
Salad dressing with oil	15	1 tablespoon
Milk		
Cream, 40%	150	¾ glass
Meat (lean)	75	1 serving (2½ oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3%	300	4 small servings (1½ cups)
Vegetables, 6%		
Fruit, 5%	50	½ serving
Fruit, 10%		
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 1 (WEIGHT 110 LBS.)

Diet 4

18 Gm. Carbohydrate
1,856 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 5%	½ serving	50
Bacon	2 slices	10
Egg	1	50
Bran soy muffin	1	25
Butter	1½ squares	15
Cream, 40%	¼ glass	50
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Egg (or egg substitute)	1	50
Vegetables, 3%	2 small servings	150
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ glass	50
DINNER		
Meat	1 serving	75
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ glass	50

SERIES 1 (WEIGHT 110 LBS.)

Diet 5

14 Gm. Carbohydrate
1,840 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 14, Protein 50, Fat 176, Calories 1,840

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	50	2
Butter	50	5 squares
Salad dressing with oil	45	3 tablespoons
Milk		
Cream, 40%	100	½ glass
Meat (lean)	90	1 large serving (3 oz.)
Bacon	20	4–5 slices
Egg	100	2
Vegetables, 3%	300	4 small servings
Vegetables, 6%		
Fruit, 5%		
Fruit, 10%		
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 1 (WEIGHT 110 LBS.)

Diet 5

14 Gm. Carbohydrate
1,840 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Tomato juice	¼ glass	50
Bacon	4–5 slices	20
Egg	1	50
Bran soy muffin	1	25
Butter	1 square	10
Cream, 40%	¼ glass	50
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Egg (or egg substitute)	1	50
Vegetable, 3%	½ serving	50
Salad:		
Vegetable, 3%	½ serving	50
Salad dressing with oil	1 tablespoon	15
Bran soy muffin	½	12
Butter	2 squares	20
Cream, 40%	⅛ glass	25
DINNER		
Meat	1 large serving	90
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	½	13
Butter	2 squares	20
Cream, 40%	⅛ glass	25

SERIES 2 (WEIGHT 140 LBS.)

Diet 1

78 Gm. Carbohydrate
2,382 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 78, Protein 63, Fat 202, Calories 2,382

Food	*Gram Weight*	*Household Measure*
Cereal	60	
Bread (whole-wheat)	60	3 thin slices
Muffin (bran soy)		6 squares
Butter	60	
Salad dressing with oil	45	3 tablespoons
Milk	100	½ glass
Cream, 40%	180	¾ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3%	300	4 small servings
Vegetables, 6%		
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 2 (WEIGHT 140 LBS.)

Diet 1

78 Gm. Carbohydrate
2,382 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	2 slices	10
Egg	2	100
Bread (whole-wheat)	1 thin slice	20
Butter	1½ squares	15
Cream, 40%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bread (whole-wheat)	1 thin slice	20
Butter	2 squares	20
Cream, 40%	¼ cup	60
Fruit, 10%	1 serving	100
DINNER		
Meat	1 serving	60
Vegetables, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bread (whole-wheat)	1 thin slice	20
Butter	2½ squares	25
Cream, 40%	¼ cup	60
Fruit, 10%	1 serving	100
Milk	½ glass	100

SERIES 2 (WEIGHT 140 LBS.)

Diet 2

45 Gm. Carbohydrate
2,250 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 45, Protein 63, Fat 202, Calories 2,250

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread (whole-wheat)	15	½ slice
Muffin (bran soy)		
Butter	60	6 squares
Salad dressing with oil	45	3 tablespoons
Milk		
Cream, 40%	180	¾ cup
Meat (lean)	135	2 servings (4½ oz.)
Bacon	20	4–5 slices
Egg	100	2
Vegetables, 3%	300	4 small servings
Vegetables, 6%		
Fruit, 5%	100	1 serving
Fruit, 10%	200	2 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 2 (WEIGHT 140 LBS.)

Diet 2

45 Gm. Carbohydrate
2,250 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	4–5 slices	20
Egg	2	100
Bread (whole-wheat)	½ slice	15
Butter	1½ squares	15
Cream, 40%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Butter	2 squares	20
Cream, 40%	¼ cup	60
Fruit, 5%	1 serving	100
DINNER		
Meat	1 serving	75
Vegetable, 3%	1 small serving	75
Salad		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Butter	2½ squares	25
Cream, 40%	¼ cup	60
Fruit, 10%	1 serving	100

SERIES 2 (WEIGHT 140 LBS.)

Diet 3

34 Gm. Carbohydrate
2,404 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 34, Protein 63, Fat 224, Calories 2,404

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	75	3
Butter	60	6 squares
Salad dressing with oil	45	3 tablespoons
Milk		
Cream, 40%	180	¾ cup
Meat (lean)	120	2 servings (4 oz.)
Bacon	10	2 slices
Egg	100	2
Vegetables, 3%	300	4 small servings
Vegetables, 6%		
Fruit, 5%	200	2 servings
Fruit, 10%	75	1 small serving
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 2 (WEIGHT 140 LBS.)

Diet 3

34 Gm. Carbohydrate
2,404 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
	BREAKFAST	
Fruit, 10%	1 small serving	75
Bran soy muffin	1	25
Bacon	2 slices	10
Egg	2	100
Butter	1½ squares	15
Cream, 40%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
	LUNCHEON	
Meat	1 serving	60
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bran soy muffin	1	25
Fruit, 5%	1 serving	100
Butter	2 squares	20
Cream, 40%	¼ cup	60
	DINNER	
Meat	1 serving	60
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	1	25
Butter	2½ squares	25
Cream, 40%	¼ cup	60
Fruit, 5%	1 serving	100

SERIES 2 (WEIGHT 140 LBS.)

Diet 4

22 Gm. Carbohydrate
2,356 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 22, Protein 63, Fat 224, Calories 2,356

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	75	3
Butter	60	6 squares
Salad dressing with oil	45	3 tablespoons
Milk		
Cream, 40%	180	¾
Meat (lean)	120	2 servings (4 oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3%	300	4 small servings
Vegetables, 6%		
Fruit, 5%	100	2 servings
Fruit, 10%	100	
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 2 (WEIGHT 140 LBS.)

Diet 4

22 Gm. Carbohydrate
2,356 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 5%	½ serving	50
Bacon	3 slices	15
Egg	2	100
Bran soy muffin	1	25
Butter	1½ squares	15
Cream, 40%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	60
Vegetables, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ cup	60
DINNER		
Meat	1 serving	60
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	1	25
Butter	2½ squares	25
Cream, 40%	¼ cup	60
Fruit, 5%	½ serving	50

SERIES 2 (WEIGHT 140 LBS.)

Diet 5

18 Gm. Carbohydrate
2,340 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 18, Protein 63, Fat 224, Calories 2,340

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	50	2
Butter	65	6½ squares
Salad dressing with oil	45	3 tablespoons
Milk		
Cream, 40%	180	¾ cup
Meat (lean)	135	2 servings (4½ oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3%	300	4 small servings
Vegetables, 6%		
Fruit, 5%	50	½ serving
Fruit, 10%		
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 2 (WEIGHT 140 LBS.)

Diet 5

18 Gm. Carbohydrate
2,340 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
	BREAKFAST	
Fruit, 5%	½ serving	50
Bacon	3 slices	15
Egg	2	100
Bran soy muffin	1	25
Butter	2 squares	20
Beverage—coffee, tea or coffee substitute	¼ cup	60
	LUNCHEON	
Cream, 40%		
Meat	1 serving	60
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bran soy muffin	½	12
Butter	2 squares	20
Cream, 40%	¼ cup	60
	DINNER	
Meat	1 serving	75
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	½	13
Butter	2½ squares	25
Cream, 40%	¼ cup	60

SERIES 3 (WEIGHT 170 LBS.)

Diet 1

95 Gm. Carbohydrate
2,853 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 95, Protein 76, Fat 245, Calories 2,853

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread (whole-wheat)	60	3 thin slices
Muffin (bran soy)		
Butter	80	8 squares
Salad dressing with oil	60	4 tablespoons
Milk	300	1½ glasses
Cream, 40%	180	¾ cup
Meat (lean)	135	2 servings (4½ oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3%	300	3 servings (1½ cups)
Vegetables, 6%	100	1 serving (1 cup)
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 3 (WEIGHT 170 LBS.)

Diet 1

95 Gm. Carbohydrate
2,853 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	3 slices	15
Egg	2	100
Bread (whole-wheat)	1 thin slice	20
Butter	2 squares	20
Cream, 40%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	60
Vegetable, 3%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread (whole-wheat)	1 thin slice	20
Butter	3 squares	30
Milk	¾ glass	150
Cream, 40%	¼ cup	60
Fruit, 10%	1 serving	75
DINNER		
Meat	1 serving	100
Vegetable, 6%	1 serving	100
Salad:		
Vegetable, 3%	1 serving	100
Salad dressing with oil	2 tablespoons	30
Bread (whole-wheat)	1 thin slice	20
Butter	3 squares	30
Milk	¾ glass	150
Cream, 40%	¼ cup	60
Fruit, 10%	1 serving	100

SERIES 3 (WEIGHT 170 LBS.)

Diet 2

54 Gm. Carbohydrate
2,725 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 54, Protein 76, Fat 245, Calories 2,725

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread (whole-wheat)	15	½ slice
Muffin (bran soy)	50	2
Butter	80	8 squares
Salad dressing with oil	45	3 tablespoons
Milk		
Cream, 40%	180	¾ cup
Meat (lean)	165	2 servings (5½ oz.)
Bacon	20	4–5 slices
Egg	100	2
Vegetables, 3%	300	4 small servings (1½ cups)
Vegetables, 6%		
Fruit, 5%		
Fruit, 10%	300	3 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 3 (WEIGHT 170 LBS.)

Diet 2

54 Gm. Carbohydrate
2,725 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD
ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	4–5 slices	20
Egg	2	100
Bread (whole-wheat)	½ slice	15
Butter	2 squares	20
Cream, 40%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	75
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	1 tablespoon	15
Bran soy muffin	1	25
Butter	3 squares	30
Cream, 40%	¼ cup	60
Fruit, 10%	1 serving	100
DINNER		
Meat	1 large serving	90
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	1	25
Butter	3 squares	30
Cream, 40%	¼ cup	60
Fruit, 10%	1 serving	100

SERIES 3 (WEIGHT 170 LBS.)

Diet 3

41 Gm. Carbohydrate
2,916 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 41, Protein 76, Fat 272, Calories 2,916

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	75	3
Butter	90	9 squares
Salad dressing with oil	60	4 tablespoons
Milk		
Cream, 40%	180	¾ cup
Meat (lean)	165	2 servings (5½ oz.)
Bacon	15	3 slices
Egg	100	2
Vegetables, 3%	300	4 small servings (1½ cups)
Vegetables, 6%		
Fruit, 5%	100	1 serving
Fruit, 10%	200	2 servings
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 3 (WEIGHT 170 LBS.)

Diet 3

41 Gm. Carbohydrate
2,916 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 10%	1 serving	100
Bacon	3 slices	15
Egg	2	100
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	75
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	1	25
Butter	3½ squares	35
Cream, 40%	¼ cup	60
Fruit, 5%	1 serving	100
DINNER		
Meat	1 large serving	90
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	1	25
Butter	3½ squares	35
Cream, 40%	¼ cup	60
Fruit, 10%	1 serving	100

SERIES 3 (WEIGHT 170 LBS.)

Diet 4

27 Gm. Carbohydrate
2,860 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 27, Protein 76, Fat 272, Calories 2,860

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	75	3
Butter	90	9 squares
Salad dressing with oil	60	4 tablespoons
Milk		
Cream, 40%	180	¾ cup
Meat (lean)	165	2 servings (5½ oz.)
Bacon	20	3–4 slices
Egg	100	2
Vegetables, 3%	300	4 small servings (1½ cups)
Vegetables, 6%		
Fruit, 5%	200	2 servings
Fruit, 10%		
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 3 (WEIGHT 170 LBS.)

Diet 4

27 Gm. Carbohydrate
2,860 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

		Gm.
BREAKFAST		
Fruit, 5%	1 serving	100
Bacon	3–4 slices	20
Egg	2	100
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	75
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	1	25
Butter	3½ squares	35
Cream, 40%	¼ cup	60
Fruit, 5%	½ serving	50
DINNER		
Meat	1 large serving	90
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	1	25
Butter	3½ squares	35
Cream, 40%	¼ cup	60
Fruit, 5%	½ serving	50

SERIES 3 (WEIGHT 170 LBS.)

Diet 5

22 Gm. Carbohydrate
2,840 Calories

QUANTITATIVE AND ESTIMATED QUANTITATIVE
TOTAL FOOD ALLOWANCE FOR ONE DAY

Carbohydrate 22, Protein 76, Fat 272, Calories 2,840

Food	*Gram Weight*	*Household Measure*
Cereal		
Bread		
Muffin (bran soy)	75	3
Butter	90	9 squares
Salad dressing with oil	60	4 tablespoons
Milk		
Cream, 40%	180	¾ cup
Meat (lean)	165	2 servings (5½ oz.)
Bacon	20	3–4 slices
Egg	100	2
Vegetables, 3%	300	4 small servings
Vegetables, 6%		
Fruit, 5%	100	1 serving
Fruit, 10%		
Vegetables and fruit, 15%		
Vegetables and fruit, 20%		

SERIES 3 (WEIGHT 170 LBS.)

Diet 5

22 Gm. Carbohydrate
2,840 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

BREAKFAST		*Gm.*
Fruit, 5%	½ serving	50
Bacon	3–4 slices	20
Egg	2	100
Bran soy muffin	1	25
Butter	2 squares	20
Cream, 40%	¼ cup	60
Beverage—coffee, tea or coffee substitute		
LUNCHEON		
Meat	1 serving	75
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	1	25
Butter	3½ squares	35
Cream, 40%	¼ cup	60
DINNER		
Meat	1 large serving	90
Vegetable, 3%	1 small serving	75
Salad:		
Vegetable, 3%	1 small serving	75
Salad dressing with oil	2 tablespoons	30
Bran soy muffin	1	25
Butter	3½ squares	35
Cream, 40%	¼ cup	60
Fruit, 5%	½	50

Diet and Skin Diseases

SKIN DISEASES CAUSED BY
  VITAMIN A DEFICIENCY
  VITAMIN B DEFICIENCY
  VITAMIN C DEFICIENCY
SKIN DISEASES OCCASIONALLY CAUSED BY ALLERGY
SKIN DISEASES INVOLVING THE SEBACEOUS AND SUDORIFEROUS GLANDS
MISCELLANEOUS SKIN DISEASES

Diet is often overestimated as an etiologic factor in skin diseases. The fact should be emphasized that there is no such thing as individual diets for each dermatosis. However, there are certain skin diseases in which nutritional therapy is an important part, if not the basis, of the entire management. In most skin conditions the normal diet, which is well balanced and adequate, such as described in the chapter on diet in health, is a rational foundation and a safe guide.

Many diseases of the skin are the direct result of metabolic or nutritional disturbances, or of functional or anatomic diseases of internal organs, particularly the gastro-intestinal tract, the liver, the pancreas, the endocrine glands and the nervous system. On the other hand, certain inflammatory processes of the skin due to infection or to chemical irritation may give rise to hepatic, digestive and other visceral disturbances and dermatoses, and internal disorders may occasionally constitute concomitant expressions of some underlying systemic disease.

The science of nutrition has thrown new light on the pathogenesis of a host of skin diseases and has provided effective weapons against many of them. We are only now beginning to sense the true importance of cellular disturbances, notably those due to some interference with the process of biologic oxidation and with other enzymatic functions—for example, in the pathogenesis of certain skin diseases associated with avitaminosis. There are five modes of action in which treatment by diet of cutaneous diseases may be effective: first, causative, notably in the dermatoses due to metabolic disorders, such as diabetes or gout, or due to gastro-intestinal diseases; second, supplementary, as in vitamin deficiencies; third, eliminative, as in the withdrawal of the offending food from the diet in allergic dermatoses and in carotenemia; fourth, biochemical, as in an effort to influence the chemistry of the skin and thereby the cutaneous reactivity—for example, the use of salt-poor diet in the treatment of lupus vulgaris; and, fifth, supportive, as in the improvement of the general nutritional state to the correction of undernutrition or the reduction of obesity. Thus it can be readily seen that the influence of nutrition on skin can be both prophylactic and therapeutic.

Skin diseases may be caused not only by malnutrition due to vitamin deficiency but by malnutrition resulting from a lack of protein or from a diet consisting mainly of inferior vegetable proteins, as is now regrettably the case in the famine-stricken areas of India and China particularly.

We will discuss diet and skin diseases from the standpoint of three groups of skin diseases in which diet may play an important role in treatment and one group of skin diseases in which diet may be a contributing factor in treatment. In the first group are skin diseases due to vitamin deficiencies. These diseases, such as pellagra, phrynoderma, keratosis, follicularis, pityriasis, rubra pilaris, cheilosis, skin manifestations of scurvy and others, which were regarded as more or less hopeless, or at least intractable, can now be greatly benefited ordinarily in a few months. In the second group of skin diseases, in which diet therapy plays an important role, are such conditions as urticaria, angioneurotic edema, lichen urticatus, dermatitis (eczema), purpura, neurodermatitis and infantile dermatitis. These conditions may be due to food allergy. The problems of identifying the responsible food allergen in any given case has been greatly facilitated by individual food testing and Rowe's introduction of elimination diets. The third group of conditions—diseases of the sebaceous and the sudoriferous glands, such as acne vulgaris—may be greatly benefited by proper dietary treatment. The fourth group, in which diet may be a contributing factor in treatment, include such conditions as acne rosacea, psoriasis, lupus vulgaris, xanthoma and allied diseases.

SKIN DISEASES CAUSED BY VITAMIN A DEFICIENCY

Vitamin A deficiency may lead to changes in proliferation and to ultimate keratinization of the epidermis as a result of various pathologic causes, such as insufficient intake of vitamin A, interference with its absorption and transportation, local destruction and local increased demand. Any one of the following conditions may be associated with and contribute to vitamin A deficiency, liver damage of various degrees, biliary-tract disease, diabetes, disturbances of fat metabolism, thyroid dysfunction, prolonged use of mineral oil, constitutional abnormalities and old age.

Follicular Hyperkeratosis (Keratosis Pilaris, Phrynoderma). The skin changes of vitamin A deficiency are characterized by hyperkeratinization of the lining epithelium of the pilosebaceous and sweat glands. The original term—follicular hyperkeratosis—was applied to the mild forms presenting roughness of the skin, particularly on the extensor surfaces of the arms, the thighs and the buttocks, due to the formation of small papules surrounding follicles filled with keratotic plugs, designated as keratosis pilaris. Severe cases of follicular hyperkeratosis accompanied by marked dryness and scaliness of the skin are called phrynoderma. Follicular hyperkeratosis is by no means absolutely pathognomonic of vitamin A deficiencies, as it occasionally occurs in ascorbic-acid deficiency. The daily oral intake of 100,000 USP units of vitamin A is advocated over a period of a few months. In some cases there are symptoms that justify small doses of thyroid medication.

Keratosis Follicularis (Darier's Disease). This rare disorder is characterized by a symmetrical, fairly generalized eruption of small papules at the pilosebaceous orifices. Lesions are reddish at first but become covered by a greasy, grayish or brownish dust, and on the scalp there are fatty crusts very similar to those seen in severe seborrhea. In this condition there seems to be some abnormality of vitamin A metabolism. The oral administration of 200,000 USP units of vitamin A daily is advocated. In cases in which vitamin A therapy is discontinued, recurrences seemed to take place at about the site of the original eruptions. Therefore in cases that yield gradually to the high dosage of vitamin A after a period of months, it is well to maintain smaller supporting doses indefinitely.

Pityriasis Rubra Pilaris. Pityriasis rubra pilaris is characterized by hard, yellowish pink or reddish papules. These are situated at the mouth of the hair follicles and oil-gland ducts, and may become generally or even universally distributed. The relationship of this condition and vitamin A was clarified by Brunsting and Sheard, who demonstrated impaired dark adaptation which returned to normal when the patient was given 150,000 USP units of vitamin A daily. The continued use of vitamin A for months resulted in slow and definite, though not complete, improvement of the condition of the skin. Gross is of the opinion that because of the response to niacin, yeast and liver therapy, pityriasis rubra pilaris is caused by a complex deficiency rather than by vitamin A alone. He therefore advocates the combined use of vitamin A and B complex. O'Leary believes that there are pathogenically two types of pityriasis rubra pilaris—those who are improved by vitamin A therapy and have an associated evidence of night blindness, and those with normal dark adaptation in whom he assumes the presence of a B complex deficiency similar to that postulated by Gross.

Ichthyosis. Ichthyosis is a congenital cutaneous disease characterized by dry, rough, scaly skin with diminished activity of the sebaceous and sweat glands and associated with abnormal cornification. Rapaport believed that ichthyosis was fundamentally due to some hereditary disturbance of vitamin A metabolism which interfered with its utilization and raised the minimal requirements for this substance. The administration of 200,000 USP units orally daily or the intramuscular injection of 100,000 USP units two or three times weekly for several months has been advocated.

SKIN DISEASES CAUSED BY VITAMIN B DEFICIENCY

Cheilosis and Angular Stomatitis (Perlèche). Cheilosis is a condition which generally begins with a small red patch at the angles of the mouth. The lesion is often referred to as angular stomatitis when it is restricted to the angles of the mouth and is bilateral and symmetrical. (See Plate 12, p. 349.) Sebel and Butter were the first to demonstrate that experimental riboflavin deficiency in man could cause the condition and that the lesions would disappear when riboflavin was added to the diet. More recent studies indicate that cheilosis may be due to multiple vitamin B deficiencies, and occasionally the lesions fail to respond just to the use of riboflavin but yield to one or more, or all, of the vitamin B complex in the form of yeast or liver extract. Finnerud has pointed out that these cases fall into four major classes from the pathologic viewpoint: (1) Infectious perlèche, either of local bacterial etiology, streptococcal or staphylococcal, or of mycotic origin, generally monilia; (2) mechanical perlèche, occurring in people with malocclusion or resulting from ill-fitting artificial dentures or appearing in the aged in whom atrophy of the tissues has led to some overhanging of the upper lip and its lateral margins; (3) vitamin-deficiency perlèche and idiopathic perlèche, in which no etiologic factor can be demonstrated. Treatment should be the use of riboflavin, 5 mg. three times daily. If no response occurs within ten days to two weeks, pyridoxine, 100 mg. daily, should be given. Niacin, such as nicotinamide, 100 mg. three times a day for a week, may be necessary, or the entire vitamin B complex in the form of 3 cc. of crude liver extract subcutaneously three times weekly, or Brewers' yeast, one tablespoonful three times a day, may ultimately be required.

Pellagra. Pellagra and pseudopellagra are greatly benefited by high vitamin diets. The skin and the tongue manifestations of pellagra, Plate 11, page 348, are discussed in the chapter on deficiency diseases, as well as the dietary and supplementary vitamin treatment.

Plummer-Vinson Syndrome. Plummer and Vinson described a vitamin B deficiency disease which is encountered almost exclusively in middle-aged women who present a combination of hypochromic anemia with dysphagia and glossitis. The majority of cases have an associated achlorhydria. The lips are thin and the opening of the mouth is small and inelastic, giving the patient a rather characteristic appearance. There are atrophic changes, most pronounced on the tongue, which becomes entirely smooth in typical cases and there is apt to be an associated atrophy of the mucosa of the mouth, the pharynx and the esophagus. There may be spoon-shaped nails, or the nails may be soft and often break readily. Ahlbom suggests that this syndrome is a precancerous lesion. He states that out of 250 cases of carcinoma of the mouth and the upper respiratory tract in women, he found that no less than 70 per cent had had the Plummer-Vinson syndrome. The dietary deficiency is probably vitamin B, and treatment consists of iron and liver extract. The liver extract seems to be far less effective alone than when given in combination with iron. Brewer's yeast and a liberal, highly nutritious diet are also recommended.

Seborrheic Dermatitis. Localized seborrheic dermatitis and at times extensive lesions seem to respond well to treatment with crude liver extract. This condition has been seen often secondary to vitamin B complex deficiencies of one type or another resulting from an underlying condition of deficiency associated with digestive or absorptive disorders.

SKIN DISEASES CAUSED BY VITAMIN C DEFICIENCY

The classic disease caused by deficiency of ascorbic acid is scurvy. The typical skin lesions consist of small purplish petechiae grouped round the hair follicles on the thighs and the legs. These lesions may be associated with the appearance of bruises and deeper extravasations of blood, as well as with the well-known signs in the mouth with spongy, bleeding gums. The treatment consists of 100 mg. of ascorbic acid orally three times a day, or 1,000 mg. daily injected parenterally until the lesions have disappeared.

SKIN DISEASES OCCASIONALLY CAUSED BY ALLERGY

Purpura. Purpuras are conventionally divided into two main groups, the nonthrombocytopenic and the thrombocytopenic. The purpuras we will discuss are of nutritive allergic or nutritive toxic origin. Petechial hemorrhages of the skin, as well as of the mucosa of the mouth and the throat, have been described following the ingestion of cow's milk and anchovies. Nutritive allergic purpura can readily be differentiated from the nutritive toxic form, which may be due to spoiled food by the fact that the manifestations of the former appear after every ingestion of the food in question, while the symptoms of toxic purpura are elicited only by one accidental exposure. Henoch's purpura denotes the type in which purpuric attacks are associated with visceral and joint manifestations, and this condition more often than not may be due to an allergy to some food. Alexander and Hampton have demonstrated that elimination of certain foods from the patient's diet prevented the purpura and accompanying intestinal attacks, while these symptoms promptly reappeared following ingestion of the foods in question.

Vitamin deficiency is an important cause of purpura of nonthrombocytopenic origin. It is of course well known that a deficiency of vitamin C, P or K may lead to rather severe cutaneous and internal bleeding.

Eczema. Eczema is a name given to a symptom or manner of reaction of the skin to a great number of causes, both internal and external. Eczema may be the result of dietetic factors, as in food allergy, dysfunction or diseases of the gastro-intestinal tract, metabolic disturbances and hypersensitiveness to pollens, bacteria, fungi, plants and chemicals, such as chronic arsenic poisoning. Authorities differ with regard to their meaning of the term eczema.

With such varied etiologic factors it must be concluded that no rational diet can be prescribed for eczema until the source of the trouble has been determined. Apart from those cases of eczema that are due to food allergy, for which we refer to the chapter on food allergy, the diet should be simply a well-balanced one with an abundance of vitamins, plenty of fruits and vegetables, milk and water. Alcohol, condiments and spices should be avoided, as well as excessive sugar, starches and fats.

Urticaria. The etiology of urticaria is extraordinarily manifold and we cannot touch upon the various causative factors. Urticaria is frequently the expression of a specific alimentary idiosyncrasy to the animal and the vegetable proteins, and hypersensitivity to carbohydrate is not uncommon. Table salt should not be overlooked. In some cases response has followed the use of an alkaline diet (see pp. 578 and 579). We refer to the chapter on food allergy for elimination diets, since many cases are due to food allergy. If the patient with urticaria is not milk-sensitive, we would urge the use of an abundance of milk, since calcium is usually beneficial. (See high calcium diet, pp. 364 to 371.)

Quincke's Edema (Angioneurotic Edema). An intimate pathologic relationship exists between angioneurotic edema and urticaria, and it is not uncommon to find these two conditions present in the same individual. Many of these cases are due to food sensitization, although some are due to a bacterial allergy. Others are distinctly idiopathic. Effort at diet treatment is the same as for urticaria.

Erythema Multiforme (Toxic Rash). This condition is probably related to both urticaria and eczema. Drug idiosyncrasy is probably more frequently responsible than in eczema or urticaria. Occasionally food is responsible. Galloway described a case due to black currants and nuts, Engman to pork, and Fordyce to lobster. The dietary suggestions under urticaria and food allergy may be applied equally well in erythema multiforme.

SKIN DISEASES INVOLVING THE SEBACEOUS AND SUDORIFEROUS GLANDS

Acne Vulgaris. Acne vulgaris is a chronic inflammatory disease of the sebaceous glands and the pylosebaceous structures of the skin, and is almost always associated with seborrhea. Patients with acne can be subdivided into several distinct groups—endocrine, gastro-intestinal, infectious, allergic, nutritional and medicamentous. The underlying basis for acne vulgaris is an oily skin, and certain bacteria find an oily skin an excellent culture medium. Apparently the secretion of sebum after a carbohydrate-rich nutrition is greater than after fatty nutrition. The diet should consist principally of fruits, vegetables, milk, eggs and meat. Many patients are aware of the fact that sweets aggravate the condition. All candy, pastries and ice cream, as well as highly seasoned foods, indigestible foods and stimulating foods, should be avoided. Special attention should be given to eliminating any digestive disturbances—constipation, endocrine dysfunction, particularly thyroid and menstrual, and foci of infection. We give below typical foods that are allowed and those that ought to be avoided:

The typical foods that are allowed without restriction are:

Lean meats
Fowl
Fish
Whole-grain cereal and their preparations—bread, crackers, rolls, muffins
Cooked or raw vegetables
Fresh or stewed fruits, fruit juices
White of egg
Cottage or cream cheese
Skimmed milk, buttermilk
Weak tea
Weak coffee

The typical foods that are permitted in limited quantities:

Egg yolk
Cream
Potatoes
Fats
Bread
Rice
Noodles
Macaroni
Spaghetti
Sugar
Sherbet
Condiments

The typical foods that are prohibited:

Fried foods
Cheese, except cottage cheese or cream cheese
Alcoholic drinks
Soda-fountain drinks
Ice cream
Chocolate
Pastries—pies, cakes
Oils—oily salad dressing
Nuts
Jams, jellies, marmalades, preserves, honey
Sirup of canned foods

Seborrhea. Seborrhea is a functional disturbance of the sebaceous glands, characterized by an increase in the amount of sebum secreted. It often leads to inflammatory processes, such as are sometimes seen in riboflavin or vitamin B deficiencies, known as seborrheic dermatitis. Seborrhea occurs most frequently at puberty or during adolescence, often at a time of the greatest gonadal activity. The pathogenesis of this disorder is not well understood. It does seem that the condition is aggravated by the excessive intake of fat or concentrated sweets and starchy foods or alcohol. The dietary management of seborrhea therefore is very similar to that outlined for acne vulgaris.

Hyperhidrosis. The term hyperhidrosis denotes excessive production of sweat.

The condition may be idiopathic or symptomatic. Von Noorden was of the opinion that the relative scarcity of sodium chloride in the blood and also in the skin served to withdraw from the sweat glands one of the substances necessary for the production of sweat. He advocated a diet very liberal in table salt. In addition, it is well to avoid strong tea, coffee or alcohol because of their tendency to promote sweating.

MISCELLANEOUS SKIN DISEASES

Psoriasis. Although the exact cause of this disease is unknown, its course can be modified to some extent in certain cases by dietary measures. Schamberg and others believe that retention of nitrogen is of etiologic importance and have reported good results from very low protein diets. The chief proteins to be avoided are meat, fowl, fish, milk, egg and cheese. Many physicians, however, have repeatedly failed to observe improvement after restricting the nitrogen intake. Certain dermatologists have emphasized the significance of overnourishment in psoriasis. Veiel has reported that psoriasis patients, especially overfed ones, seemed to lose their susceptibility to recurrences during the war period when food was scarce and protein intake was low, only to have recurrences when the war was over. Many other suggestions have been made—for example, strict vegetarian diets, purine-free diets, low carbohydrate diets and, recently, the salt-restricted dietary with its reported benefits. Alcohol, coffee, tea and stimulants are, as a rule, to be interdicted. However, it must be concluded that at present dietetic management of psoriasis offers little hope of cure.

Acne Rosacea. The exact cause of acne rosacea is unknown, although numerous theories have been advanced. Some hold that it is a disturbance of metabolism resulting from overindulgence in starch; others hold meat and proteins responsible. Many patients have a gastric secretory disturbance, most frequently a hypochlorhydria or an active achylia. In these instances the use of the diet for hypo-acidity and dilute hydrochloric acid by mouth is gratifying. The diet most suitable to this condition is a simple one, avoiding fried and greasy foods, rich desserts and condiments, tea, coffee or hot drinks.

Xanthoma is the result of a general or local disorder of the cholesterol metabolism. In most cases it is accompanied by high lipid and cholesterol levels, and it was naturally assumed that a low fat and particularly a low cholesterol diet would be beneficial. Many authorities are of the opinion that a diet low in cholesterol and entirely free of animal fat—that is, a vegetable diet—is of therapeutic value in primary essential xanthomatosis of the hypercholesterolemia type. A decade ago Thompson and Bennhold stressed the close relationship between carotene and cholesterol, claiming that the yellow color of the xanthoma nodules was due to their abnormally high carotene content. The explanation was projected that when the ability of the liver to transform carotene to vitamin A and to store the latter was impaired, the organism became flooded with vitamin A. This in turn promotes excessive production of fatty bodies, particularly of phospholipid substances, the accumulation of which leads to the formation of xanthoma. The therapy outlined by Wiedmann should be given a thorough trial. This comprises reduction of the vitamin A intake and the exclusion from the diet of such vegetables as spinach, carrots, red peppers, tomatoes, peas and lettuce; of such fruits as apricots and prunes; such dairy dishes as butter, cream, cheese, eggs, dried whole milk; and beef, liver, kidneys and oysters. It is interesting to note Montgomery's report, which states that he obtained good results with treatment consisting of 200,000 units of vitamin A plus 7½ grains of dehydrochloric acid daily for five months. This may have been due to the possible beneficial effect of the choline on the liver. The well-known lipotropic effect of lecithin and choline justifies the use of lecithin, but the author has seen a striking decrease in the serum cholesterol and definite clinical improvement following the prolonged administration of lecithin.

Mention should be made of the occasional development of xanthoma and xanthosis (carotenemia) which results from the eating of too large quantities of vegetables and other foods containing carotene and the kindred pigment xanthophyll.

Necrobiosis Lipoidica Diabeticorum. A lipoid disease with a diabetic basis is the dermatosis which has been termed necrobiosis lipoidica diabeticorum by Urbach. Hildebrand, Montgomery and Rynearson established the fact that the condition was associated with diabetes mellitus in more than 87 per cent of all cases described. Treatment of necrobiosis lipoidica diabeticorum is primarily in control of the underlying diabetes. A diet is recommended to be very low in fat and moderately high in carbohydrate supported by insulin.

Lupus Vulgaris. Lupus vulgaris and other varieties of tuberculosis of the skin have been treated with varying degrees of success by the use of the Gerson diet and the Sauerbruch and Herrmannsdorfer diet. These diets are salt-poor, high in vitamins and minerals (other than sodium), high in fat and low in carbohydrate. Both diets seek to dehydrate the tissues and to modify the body's mineral balance. The Gerson diet is low in protein and yields an alkaline ash, and the fluid content is derived principally from juices extracted from raw vegetables and raw fruit. The Sauerbruch and Herrmannsdorfer diet is moderately high in protein, yields an acid ash, and the fluid content is derived mainly from milk.

There is still considerable controversy regarding the possible therapeutic mechanism of these diets both in Germany, where they originated, and in the United States. Considerably more investigative work must be done before definite conclusions regarding the value of these diets can be reached.

Diet and Dental Caries

- IMPORTANT FACTORS THAT MAY INFLUENCE DENTAL CARIES
  - ENVIRONMENTAL FACTORS
    - ORAL HYGIENE
    - MICRO-ORGANISMS
    - CARBOHYDRATE
    - SALIVA
  - NUTRITIONAL FACTORS
    - CARBOHYDRATE

- IMPORTANT FACTORS THAT MAY INFLUENCE DENTAL CARIES (*Continued*)
  - NUTRITIONAL FACTORS (*Continued*)
    - ACID-BASE BALANCE
    - MINERALS
    - VITAMINS
  - HEREDITY
  - AGE

The etiology of dental caries has been discussed by many investigators in recent years, but there has been no definite agreement regarding it. This chapter has been written not with the idea of presenting new facts but of attempting to correlate the available data and discuss the various factors suggested that may enter into the production of caries. Consideration must be given to the relationship of one factor to another as each and all may influence tooth decay, and not to each factor independently as responsible for caries.

A knowledge of the structure of the teeth is necessary in order to understand the role of the various factors on which the development of teeth depends.

The external surface of a tooth is hard enamel, composed of phosphate and carbonate of lime. Its formation is brought about by the calcification of a substance secreted from the cells (ameloblasts) of the "enamel organ." Beneath this is a dense, bonelike substance—dentin—which forms the main part of the tooth. The dentin is made up of numerous fine tubules which radiate outward and upward from the pulp cavity. The tubules contain elongated processes which have their origin in odontoblasts or the superficial cells of the pulp.

A deficient diet leads to bad teeth and bad teeth lead to bad digestion and assimilation of any diet. The question of the development and the preservation of good teeth is one of vital importance.

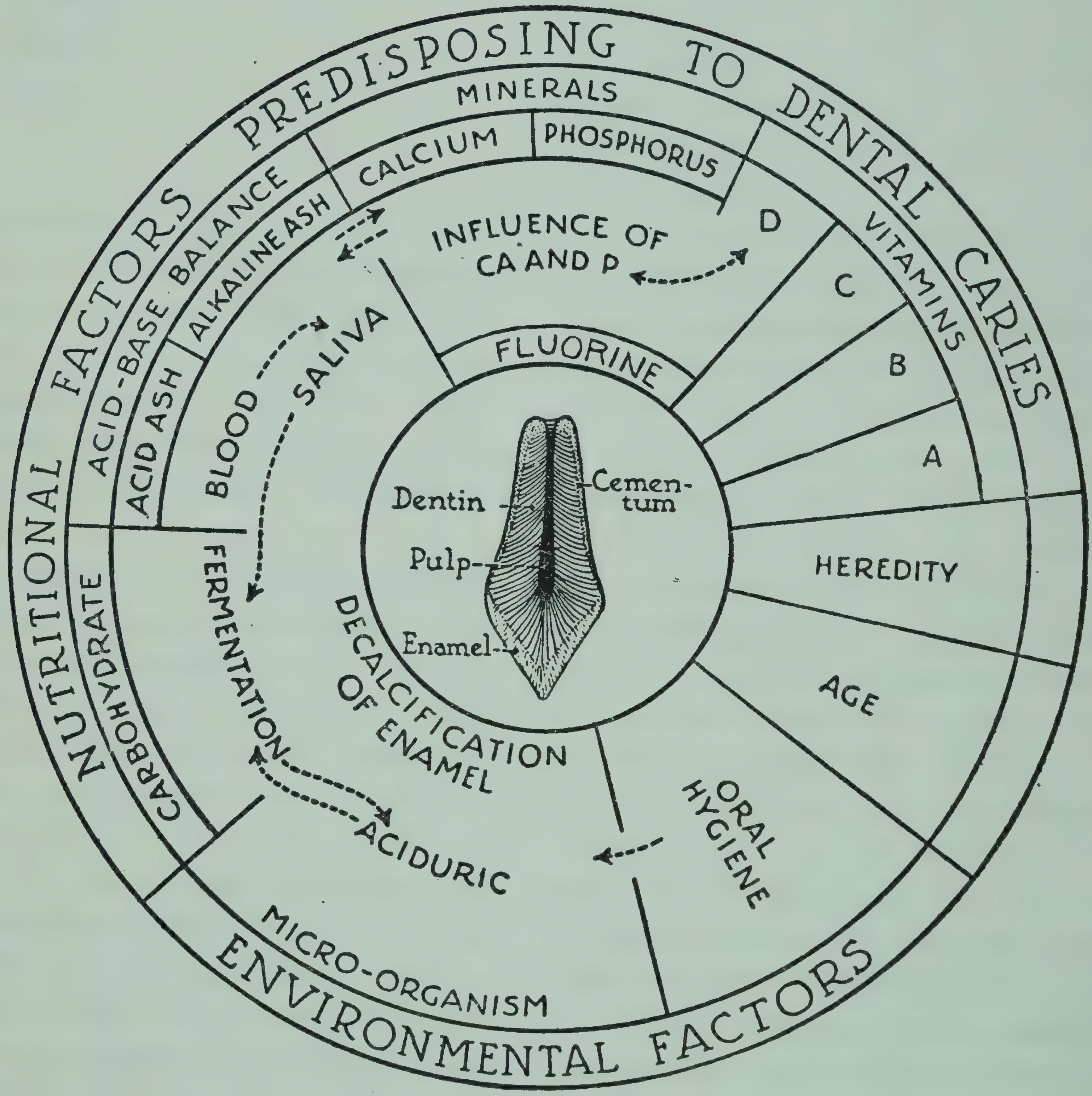
It has been shown that diet plays an important part in the development of the body, and it can be shown that it plays an equally important part in the growth of the teeth, a part which is antenatal as well as postnatal.

A great deal of work has been done during recent years regarding the relation between diet and dental caries. Many have been too ready to accept conclusions of a nutritional nature as they are published without regard to the value of the methods used in arriving at such conclusions. Many hypothetical opinions have been expressed on this subject. Various investigators have conducted their research from widely different points of view and have not used the same type of animal for experimentation. This has resulted in many diverse opinions.

IMPORTANT FACTORS THAT MAY INFLUENCE DENTAL CARIES

Environmental Factors

Oral hygiene



NUTRITIONAL FACTORS PREDISPOSING TO DENTAL CARIES
MINERALS
CALCIUM
PHOSPHORUS
ACID-BASE BALANCE
ALKALINE ASH
ACID ASH
VITAMINS
D
C
B
A
INFLUENCE OF CA AND P
FLUORINE
BLOOD
SALIVA
Dentin
Cementum
Pulp
Enamel
HEREDITY
AGE
CARBOHYDRATE
FERMENTATION
DECALCIFICATION OF ENAMEL
ACIDURIC
ORAL HYGIENE
MICRO-ORGANISM
ENVIRONMENTAL FACTORS

Important factors that may influence dental caries.

- Micro-organisms
- Carbohydrate
- Saliva

NUTRITIONAL FACTORS
- Carbohydrate
- Acid-base balance
- Minerals—calcium, phosphorus, fluorine
- Vitamins

HEREDITY

AGE

Environmental Factors. The pioneer work in the study of the etiology of caries was started by Miller. Black, Williams and Gies also emphasized the local environmental factors. The chief points under environmental factors are oral hygiene, micro-organisms, carbohydrate and saliva.

ORAL HYGIENE. The thought prevailed a few years ago that a tooth kept as clean as possible by brushing never decayed. This idea has been discredited. Daily brushing of the teeth is an important part of personal hygiene, yet the artificial cleaning of the teeth is not a sure preventive of dental caries. Caries may be somewhat delayed by it, but decay may occur despite recurrent cleansing. Many people who apparently keep their teeth scrupulously clean have many cavities, while others with visibly dirty mouths remain free from caries. Dentifrices have little effect through chemical action in preventing decay. Their only value lies in aiding to remove mechanically the bacterial accretions. Mouth washes reduce somewhat the bacterial count in the saliva. Wallace and Pickerill were leading advocates of efficient chewing of hard food as a protection against caries. Excessive mastication is of value to the gum tissue by stimulation primarily and not a specific for immunity. Their desire was to cleanse the teeth mechanically of starchy carbohydrate by hard raw fruits or coarse vegetables. Some mouths remain immune even while continuously coated with starchy carbohydrate food. It has been suggested that a thorough cleansing of the mouth followed by the filling of all cavities frequently checks the development of new cavities for a period of time, but this is not a definite procedure that will ensure against further caries.

MICRO-ORGANISMS. Many investigators have felt that the problem of dental caries was related to the bacteriologic factor. Since Miller brought forth his theory of dental caries in 1890, many attempts have been made to find a definite micro-organism that would precipitate dental caries. He described a number of micro-organisms he felt were capable of initiating caries by the formation of acid from carbohydrate-food debris in the mouth. An aciduric type of micro-organism, apparently identical with *Bacillus acidophilus,* is most generally conceded to be responsible for the fermentation of carbohydrate to form acids. It is this acid in turn that erodes the inorganic material of the enamel and dentin and leaves the organic matrix of the dentin to be digested by proteolytic enzymes and caries formation results. Micro-organisms of some type are present on practically all teeth and the majority of them are capable of fermenting sugars to form acids.

Some authorities report that the presence or absence of certain aciduric types of micro-organisms in the mouth constitutes one of the most constant variables between the immune or susceptible mouth and dental caries. The study of Bunting and his associates, McIntosh, James, Roderiques and others has led to some interesting observations. An aciduric micro-organism was found to be present in practically every lesion of active dental caries. Some mouths seem to harbor a medium that is unfavorable to the growth of aciduric micro-organisms and these same mouths are free from dental caries. Elimination of *Bacillus acidophilus* from the mouth is followed by a complete disappearance of dental caries. Attempts have been made to determine what factors may influence the medium of the mouth that is antagonistic to the growth of *Bacillus acidophilus.* Also, efforts are being made to study the influence of diet and nutrition on the growth and the activity of the aciduric micro-organisms. Tucker, in his studies to find the possible relation of aciduric and acidogenic micro-organisms to dental caries, found micro-organisms of some type in practically every case studied. He isolated streptococci, staphylococcus, *L. acidophilus* and yeasts. He was unable to correlate the incidence of dental caries with the occurrence of some one type of aciduric micro-organisms. He also found aciduric streptococci irrespective of the incidence of dental caries. He did feel, however, that some relationship existed between the persistent pressure of *L. acidophilus* and cavities in the teeth. Mellanby and Percy Howe both feel that the bacteriologic factor in caries is comparatively unimportant when the teeth are well formed, and that it is only significant when the teeth are irregularly arranged and badly formed. Neither of these investigators has produced substantial experimental proof; their deductions are largely inferred reactions.

CARBOHYDRATE. Carbohydrate as such has been considered to play an important role because candy and other sticky sugars retained about the teeth afford a most favorable film for holding and feeding aciduric fermentative organisms.

Many interesting reports have been made of studies of people and races in various parts of the world who are relatively free from dental caries. In most of these studies, whether the habits were vegetarian or carnivorous in type, the important factor with regard to the presence or absence of dental caries was the consumption of sugar. In other words, caries was independent of all dietary factors other than carbohydrate. It is very significant that races who used only a small percentage of carbohydrate in their dietary habits and who were free from dental caries developed caries with the introduction of high carbohydrate foodstuffs.

SALIVA. The action of the acids on tooth enamel and the effect of buffers in the saliva as a modifier of this action are of tremendous importance. Saliva is one of the chief environmental media. Were it not for the buffers of saliva the teeth would be seriously damaged by the fluids in contact. It seems very likely that whatever controlling influences exist in the media of the mouth that determine the activity of the aciduric micro-organisms, the influences lie in and are carried by the salivary fluids. What these influences are, their nature or mode of activity, are not known as yet. It seems from evidence thus far that it is not the calcium, phosphorus or pH values. It is fascinating to speculate upon what salivary constituents determine that micro-organisms may grow luxuriantly in one mouth with caries and what factors of these constituents benefit their growth in another with no evidence of caries. In the study of the natural action and constituents of saliva we are taken away from environmental factors alone by considering heredity, general health, nutrition and other influences. It is possible that through chemical, bacteriologic and nutritional studies of salivary principles we may come to a better understanding of the control of dental caries. In addition, one must bear in mind the various types of films, bacterial overgrowths and food debris that interfere with the ready movement of salivary fluid into all the tooth areas.

Nutritional Factors. In the past decade the relation of deficient diet and defective nutrition to the etiology of dental caries has been studied extensively. Deficient diets seem to have a predisposing relationship to dental caries. Diets that are well balanced and adequately rich in vitamins A, B, C and D yielding an alkaline ash, when followed consistently through the developmental period of the teeth, apparently produce teeth that are less liable to decay. Continuation of these same principles in diet after eruption of the teeth may cause the production of saliva having a slightly protective potency against caries.

Probably the majority of those studying the etiology of dental caries today would be willing to grant that the action of aciduric micro-organisms, producing bacteriologic fermentation with the production of acid which erodes the surface of the enamel, paves the way for the development of dental caries. But investigators differ widely in their explanation of what nutritional factors determine the susceptibility or the immunity to caries and their relation to diet. The points to emphasize in discussing these nutritional problems in relation to dental caries are carbohydrate, acid-base balance, minerals and vitamins.

High carbohydrate intake is apt to interfere with the appetite. It is also likely to replace other needed foods to take up an adequate protective diet and thus a state of poor nutrition may develop. The amount of carbohydrate in the diet bears a close relationship to the acid-base balance.

Acid-base Balance. Certain authorities speak of dental caries as if it were synonymous with the condition of acid-base balance. They discuss the prevention of caries in terms of the development of a strong alkaline reserve in the blood and a highly alkaline saliva which may combine with the acids of the localized fermentation in the mouth associated with caries. The potential alkalinity or acidity of the diet is considered the important thing. A diet with a high acid ash favors caries, while one with an alkaline ash favors immunity. Jones, Larson and Pritchard have advanced a theory that ultraviolet light causes an acid condition in the blood. In the tropics, where there is a great deal of sunshine, this tendency toward an acid condition of the blood may be compensated for by the food of the tropics, mainly vegetables and fruits, which yield an alkaline ash and thus neutralize the effect of sunshine. The teeth are in a healthful condition. On the other hand, in cold climates, where there is a lack of ultraviolet light, an alkaline tendency of the blood may result. This alkaline tendency is compensated for by the fact that the diet of these people is largely made up of meat, which yields an acid ash. Bodecker's theory of the etiology of dental caries is that acidosis involving the buffering action of the blood in some way is associated with caries. The work of Jones, Larson and Pritchard on dogs points to the acid-base balance of the blood as an indicator of a decay process. Hawkins stresses the importance of acid-base balance in the blood and saliva as related to nutrition and dental caries. Yet many chemical studies of the blood and the saliva in those susceptible to caries and those who are immune show practically no differences in pH or carbon-dioxide combining power.

The neutralizing power of the saliva against acids may be a very important factor in the prevention of caries. A potentially alkaline diet, by increasing the blood alkali reserve, may prevent caries. Pritchard has shown that while a potentially acid diet favors decay, he also reports from his investigations that in Hawaii he has seen no cases of caries in children over three years of age who lived on a potentially alkaline diet. Similarly, Bunting has shown that diets potentially alkaline, high in vegetables and milk, practically eliminate caries in children.

MINERALS. There is a general belief that loss of teeth is associated with pregnancy. A common saying is that with every baby a mother loses a tooth. There is a surprisingly small amount of accurate data in the literature of the role of pregnancy and the increased incidence of dental caries.

Toverud and Toverud made an extensive study of the mineral metabolism during pregnancy and concluded that the deficient intake of calcium in the diet during pregnancy and lactation caused the increased incidence of caries at that period. They found evidence of disturbances in the calcium and phosphorus metabolism associated with pregnancy. Negative balances were found in nearly all cases during the last two months unless the diet contained at least 1.6 Gm. of calcium and 2.0 Gm. of phosphorus per day.

It is a belief that a high calcium content of saliva is an inhibitive influence to the development of caries. Mellanby and Toverud have demonstrated the role of vitamin D and calcium and phosphorus metabolism in the formation of sound teeth in experimental work. Attention has been called to the relationship between acid-base balance and calcium and phosphorus balance in the blood and the saliva as related to nutrition, and yet the most recent work shows practically no difference in those immune to and those susceptible to caries in the amount of calcium, phosphorus, pH concentration, carbon dioxide and diastatic action of the blood and the saliva. Caries is not due to calcium deficiency alone, since many children getting a quart or more of milk a day still develop caries. Mrs. Mellanby feels certain cereals in the diet have a specific inhibiting effect on calcium metabolism and, therefore, on tooth formation. She believes that oatmeal and wheat germ contain a "toxemin" which, when fed during the developmental period, antagonizes calcification of the teeth unless the diet is bountifully supplied wth fat-soluble vitamins. Howe stresses the importance of saliva metabolism in both the formative function and resistance of teeth to caries.

Fluorine in Dental Nutrition. In 1930, Kempf and McKay described opaque white mottling with brown staining of the teeth in the inhabitants of a small town, Bauxite, Arkansas, in which all drinking water at that time came from deep wells. The inhabitants of the neighboring town of Benton, who drank river water, showed no mottling of the teeth. A chemical analysis of the water in 1930 gave no hint or clue as to the cause of the disfigurement. In 1931, Smith, Lantz and Smith of Arizona University were the first to show that fluorine was the cause of mottling of the teeth. Fluorine, which occurs as a trace element in certain drinking waters, is found in rock phosphates, cryolite, a double fluoride of sodium aluminum, and in fluor spar which is used as a flux in glass etching. It is regarded as the cause of the mottling of the enamel of the teeth, characterized by opaque bands and, in some cases, brown staining. Mottled teeth may be structurally good or bad. Black and McKay feel that mottled teeth are resistant to caries. Armstrong and Brekhus found more fluorine in sound teeth (0.011 per cent) than in carious teeth (0.006 per cent).

The detrimental action of fluorine takes place during the development of the teeth, the permanent teeth being more affected than the temporary ones.

Col. H. Shortt of the Indian Medical Service and his colleagues have described cases of fluorine poisoning in which, at about thirty years of age, pain in the limbs, ossification of periarticular tissues and stiffness of the spine were characteristic. The amount of fluorine in the drinking water was from 3 to 4 p.p.m.

It seems that low concentrations of fluorine favor calcification, but that concentrations of fluorine over M/10,000 are detrimental to the calcification of bones and teeth. Recent work by Kemp, Murray and Wilson (1942) has shown a relationship between dental fluorosis and slight changes in the end plates of the bodies of the vertebrae in children. It is considered advisable to change the drinking water when the fluorine content exceeds 1 p.p.m., from 1.6 to 3 p.p.m. being regarded as sufficient to cause definite mottling of the enamel.

VITAMINS. The relation of vitamins to susceptibility to caries is very inconclusive. The diets of those immune to caries are often very deficient in one or more of the vitamins, while the patient with caries may have a diet apparently very adequate.

Vitamin A is one of the four fat-soluble vitamins. Whenever this is lacking in the diet or is provided in insufficient amount, the epithelial tissues everywhere suffer injury. The epithelial cells tend to keratinize and become similar to the outer layer of the skin. Howe and Wolbach have called attention to the fact that when the diet is deficient in vitamin A, the odontoblasts revert to osteoblasts and the latter may subsequently lay down bone where dentin would normally have been formed. The etiology of pulp "stones" is suggested by this observation. We have no observation tending to show whether in poorly nourished human subjects vitamin A deficiency may exercise an adverse influence upon the odontoblasts. In other words, we do not know how sensitive are the odontoblasts to an undersupply of vitamin A, nor do we know what period of partial deprivation would affect them adversely. That vitamin A has a definite action in maintaining the growth of the incisor teeth in rats and guinea pigs is shown by the chalky or white appearance and the brittle nature of the enamel of these teeth when the animals are fed on a deficient in vitamin A diet. On the withdrawal of vitamin A from the diet, the enamel organ soon ceases to function and, with the subsequent loss of enamel, dentin is exposed; ultimately the odontoblasts suffer damage and finally atrophy. Geives and McCollum learned that deficiency of vitamin A and calcium had a pronounced effect on development of teeth.

Vitamin B. It is well known that deprivation of vitamin B results in injury to the peripheral nerves, but no one has investigated the nerves in the pulp to ascertain whether these undergo the same changes as do the peripheral nerves generally.

Leukoplakia is a generic term used to designate a number of histologically different conditions. The chief clinical characteristic of the disease is a whitish surface on the mucous membrane of the cheeks, the gums or the tongue, with a mucous membrane appearing as though it had been painted with silver nitrate. These thickened white patches sometimes show a tendency to fissure. This condition is common in smokers and sometimes tends to become malignant. The clinical appearance of leukoplakia is due either to epithelial hyperplasia or to hyperkeratosis. Vitamin B is thought to have a marked etiologic influence on this condition. Martin and Koop feel that deficiency disease, especially avitaminosis B, causes the degenerative changes that lay the foundation for the development of leukoplakia. They feel that the local irritant—trauma or tobacco, for example—is an extrinsic factor that acts on a medium properly prepared by an extrinsic factor such as avitaminosis B. The treatment that they advise is an adequate diet including three vegetables, legumes, pork, chicken and whole wheat, supplemented by two or three tablespoonfuls of dried, granular yeast or, in certain cases, vitamin B concentrates given parenterally, or liver extract. Orr, from his studies of intra-oral cancer in betel-nut chewers, concluded that an avitaminosis was far more important in the development of the cancer than was the quid of betel that the natives held in their cheeks. He made this conclusion after observing that the coolies working on tea estates were comparatively free from intra-oral cancer, whereas those not so employed were ravaged by it, though both chewed betel quids. This difference possibly could be attributed to the fact that the estate coolies were able to secure a greater variety of vegetables and more adequate food intake than the unemployed coolies.

All investigators agree that no dramatic results may be expected from vitamin B therapy if the lesion has been of long duration and is far advanced. In any form of leukoplakia the treatment must be intensive and prolonged.

Vitamin C. Vitamin C, the antiscorbutic vitamin, has also a specific function in the development of healthy teeth. The bleeding gums and the progressive loosening of the teeth in scurvy are evidence of the lack of ascorbic acid in the diet. That under these conditions changes are present in the structure of the teeth was first recorded in 1916 by Jackson and Moore, who described hemorrhages in the pulp of the teeth in guinea pigs. In 1919, Zilva and Wells corroborated this and further showed that the first signs of scurvy in monkeys were to be found in the teeth. These signs related to changes in the microscopic appearance of the odontoblasts from which the dentinal tubules develop and upon whose normal tubular structure the nutrition of the teeth depends (Bodeeker, Hojer). Continued deterioration of the teeth results in damage to or destruction of the enamel-forming cells (ameloblasts) (Fish and Harris, 1934). Vitamin C also controls the formation of the cement layer between the gum and the dentin, so important for the firm setting of the tooth in the bone. These important findings had first of all their factual basis in experiments on rats, dogs, guinea pigs and monkeys.

Unusual interest attaches to the relation of vitamin C deficiency to the health of the teeth. Earlier studies showed that as scurvy developed the endothelial tissues were especially susceptible to injury. It is due to this that the capillary vessels break down, causing the hemorrhage characteristic of the disease. It remained for Hojer to demonstrate that the odontoblasts were peculiarly susceptible to injury through deficiency of vitamin C. Since capillaries are so sensitive to vitamin C deficiency, there is likely to be hemorrhage in the pulp cells and injury to the odontoblasts. The subject needs further study. The point to be emphasized is that the odontoblasts are so much more sensitive than the capillaries to a deficiency of vitamin C that in approximately half the time necessary to produce clinical evidences of scurvy through deficiency of the vitamin, injury to these important structures in the pulp has already developed. An explanation is needed of the frequency of occurrence of pulpless teeth. Since Lind showed many years ago that clinical scurvy developed in man after about forty days of total deprivation of fresh, uncooked vegetable foods, we may be justified in suspecting that even twenty days of deprivation of vitamin C in an adult would cause injury to the pulp, which could be demonstrated histologically. Howe believes that deficiency of vitamin C is an important cause of dental caries. He produced the first experimental caries of the teeth by scorbutic diets. When he gave orange juice he noted the arrest of caries. Hanke and his collaborators accented the importance of vitamin C. They stressed the value of a diversified diet. They used large amounts of orange juice because they felt the average American diet was rather deficient in vitamin C. They do not claim that the results obtained are to be attributed to vitamin C alone, although this seems likely.

Vitamin D. There can be no reasonable doubt that there is a close relation between deficiency of vitamin D in the diet and the structure of the teeth. The work of Mrs. Mellanby on pulps has demonstrated clearly that diets of a character which tend to produce rickets tend also to interfere with the proper calcification and enameling of the teeth. Vitamin D, as is well known, has remarkable power to regulate calcium and phosphorus metabolism. A suitable provision of it is effective in the prevention of rickets, even when dietary conditions are such as to disturb bone growth.

It is known that children will develop both caries and rickets even when their diet includes milk, and therefore is not lacking in calcium, but is almost free of vitamin D. Puppies fed on a rickets-producing diet—that is, a diet deficient in mineral salts and vitamin D—show thickened jaw bones, delayed eruption and irregular formation of the teeth, with a rough and grooved enamel and a poorly formed dentin.

The seasonal variations in the supply of vitamin D are well known. Not so well known perhaps is the evidence suggestive of a seasonal incidence of dental caries. In the study of the role of vitamin D in the control of dental caries in children, McBeath and Zucker of Columbia University, examining over eight hundred children from six to fourteen years of age for a period of four years, found the greatest number of new cases of caries appearing in late winter and early spring, the smallest during summer. Given graded amounts of vitamin D, from 250 to 800 I. U. daily, they were able, by the use of the highest dose of vitamin, to prevent the appearance of any increase in the number of new cases of caries in the late winter and early spring months. There is evidence also to show that sunshine and warmer climatic and living conditions are not without effect in preventing dental caries.

The role of the vitamins in caries is nebulous. Some people on diets defective in one or more apparently important vitamins are immune, and others on what seem to be adequate diets are not.

Boyd and Drain feel they have succeeded in arresting caries in children susceptible to it by adding to the diet a sufficiency of all accessory food factors. Eddy has indicated it is not a lack or an abundance of any one food factor but a balanced combination of several. McBeath tends to confirm the theory of the importance of diet as a factor in the nutritional control of caries, but his results fail to demonstrate conclusively the particular importance of any one dietary factor.

Heredity. Many observations have been presented to support the theory that good or bad teeth are inherited. Heredity probably is an important factor and perhaps deserves more consideration and study than have been given to it. Many of the sayings that back heredity as a factor in dental caries have come to us from our ancestors and are relics of the prescientific age. Some apparently sound and well-formed teeth decay while poorly formed teeth do not.

Age. Adolescence plays a considerable role in relation to the incidence of dental caries. Deciduous teeth are not structurally as nearly perfect as permanent teeth, which should favor decay. Investigations have shown that the greatest percentage of cavities develop in the early years of life and through adolescence. The highest percentage of caries is between ten and thirty years of age, the peak being reached at about twenty years of age and gradually subsiding through the remaining years of life. There is, of course, considerable metabolic and endocrine instability during early life associated with rapid growth and the changing nutritional needs from childhood to adult life. There is a condition of relative immunity from thirty years of age extending well into the age of senescence. During this period exacerbations to the point of susceptivity occur with lowered resistance, the result of poor bodily health, pregnancy and lactation, or some added stress or strain.

CONCLUSIONS

The information accumulated thus far on the relation of diet to dental caries points to the fact, at least, that an inadequate diet produces nutritional conditions that predispose to dental caries. Our knowledge of certain phases of dental caries is still debatable, and a sane viewpoint is the interrelationship of environmental and nutritional factors rather than emphasis on any one factor as responsible. Until we know the role of the many food factors as entities in caries we should merely insist that the patient follow a normal, well-balanced diet as outlined in the chapter on diet and health.

Because of the lack of indisputable data, histologic, bacteriologic, chemical or nutritional, as to what determines immunity or predisposition to caries, the problems to be met in the solution of dental caries will require the united and co-operative efforts of not only the physician and dentist but of the trained biochemist, nutritionist and bacteriologist. Great strides have already been made in this group effort in certain centers.

PART IV

ROUTINE HOSPITAL DIETS

PREOPERATIVE AND POSTOPERATIVE DIETARY MANAGEMENT

Routine Hospital Diets

Most hospital staffs have standing diet orders for use as a routine or in emergencies. It is impossible to outline a series of routine hospital diets which exactly fit the needs of every hospital. It is always necessary to alter the routine diets to meet the particular needs of the institution and the individual. These diets, which anticipate the dietetic needs of groups of patients, may be used as a guide until the attending physician alters the diet to meet the specific requirements of the individual.

WE SUGGEST SIX DIETS TO MEET THE VARIOUS NEEDS OF THE AVERAGE HOSPITAL

1. A—Nonresidue liquid
   B—Nonresidue full
2. Liquid
3. Semisolid, low residue
4. Soft, bland, low residue
5. Light, bland
6. General

These six diets vary from each other in their caloric content, the amount of residue and the ease of digestibility. The nonresidue diet contains the least number of calories and the lowest amount of residue, and is the most easily digestible. The next five diets vary from the nonresidue in increasing degrees in relation to these three factors. Any one of the six diets may be used as indicated. There is no routine preoperative and postoperative diet. In preoperative preparations the use of a high carbohydrate, high protein intake should be considered. The patient should receive additional food and water up to twelve hours preceding surgery. Large amounts of carbohydrate and protein should be given to prevent toxicity caused by the anesthetic and acidosis. When beginning postoperative dietotherapy with the nonresidue diet, it may not be necessary to proceed gradually from one step to the next; it may be possible to omit two or three steps, depending on the case at hand.

After any surgery other than gastrointestinal, the patient should be given as soon as possible a diet such as he received before operation. The proportion of carbohydrate, protein and fat, and the caloric content of these diets depend upon the amount of food the patient is able to take. In some instances it may be necessary to force feedings, while in many cases it is just as well to allow the patient to follow his own desires for a short period of time.

NONRESIDUE LIQUID DIET (1 A)

Breakfast:
Fruit juice
Tea, coffee or coffee substitute
Cream
Sugar

Dinner:
Consommé or broth, butter
Fruit juice
Gelatin
Tea, coffee or coffee substitute

Supper:
Consommé or broth, butter
Fruit juice
Gelatin
Tea, coffee or coffee substitute

NONRESIDUE FULL DIET (1 B)

Foods Allowed: Only the following (an effort should be made to keep the carbohydrate low if there is distention):

Cereals and breads—Melba toast, not buttered, zweiback

Meats—Scraped meat, white meat of chicken, chicken livers, calves' liver, whitefish, clear broths and bouillon

Desserts and sweets—Jello, water ices, jelly, honey, Karo sirup, gum drops

Beverages—Coffee, tea, ginger ale, strained fruit juices (clear), carbonated waters, concentrated fruit sirup

Breakfast:
- Fruit juice
- Melba toast
- Coffee with sugar

Dinner:
- Chicken broth
- Whitefish
- Jello
- Melba toast
- Jelly

Supper:
- Bouillon
- White meat of chicken
- Melba toast with jelly
- Jello
- Tea

Between-meal feedings: Pure sugar candy or fruit juice (strained) should be given in cases requiring more nourishment than the patient is able to take at mealtime.

LIQUID DIET (2)

Typical Foods Allowed:

Broth
Cream soups, strained clear
Vegetable soups, strained clear
Ice cream
Ices
Jello
Junket
Cereal gruels
Beef juice
Carbonated beverages
Chocolate and cocoa
Cream
Eggnogs
Fruit juices (strained)
Malted milk
Milk and buttermilk
Coffee and coffee substitutes
Tea

Breakfast:
- Fruit juice
- Cereal gruel
- Beverage
- Cream*
- Sugar

Luncheon:
- Soup
- Dessert
- Fruit juice
- Beverage

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* It may be necessary to omit cream and butter in some of the postoperative cases suffering from nausea and vomiting

LIQUID DIET (2) (*Continued*)

Dinner:
- Soup
- Dessert
- Fruit juice
- Beverage

Between-meal feedings should be given when more nourishment is required than the patient is able to take at mealtime.

SEMISOLID, LOW RESIDUE DIET (3)

Typical Foods Allowed:

Cereals	All fine cereals, such as Cream of Wheat, Farina, rice, cooked with or without milk; also corn-meal mush
Bread	White, plain or toasted, white crackers
Beverages	Milk, with or without cream; malted milks, eggnogs, weak cocoa, bland fruit juices reinforced with egg white, Ovaltine
Eggs	Soft-cooked, poached, shirred, soft-scrambled, omelet
Soups	Cream soups
Vegetables	Vegetable juice
	Macaroni, spaghetti, noodles, plain or creamed; rice, boiled or creamy
Fruits	Fruit juice (strained)
Cheese	Cottage or Philadelphia cream cheese
Desserts	Plain Jello, junket, custard, plain vanilla ice cream, simple puddings, such as cornstarch, rice, bread, tapioca, snow pudding
Salt Butter and	Allowed in moderation, but pepper omitted entirely
Cream	As desired

Typical Foods to Avoid:

Highly seasoned foods and sauces, such as catsup, vinegar, mustard, pepper, condiments of all sorts; bran or coarse-fibered or gaseous, flatulent foods (vegetables, fruits or cereals); rich pastries, hot breads, griddle cakes, waffles

SEMISOLID, LOW RESIDUE DIET (3) *(Continued)*

Breakfast:

Fruit juice (strained)
Eggs, any style
Bland cereal (Farina, rice flakes, oatmeal, etc.)
Cream
Sugar
Toasted white bread
Butter (moderate amounts)
Coffee or cocoa

Midmorning Snack

Fruit juices (strained), cocoa or broth
Crackers

Luncheon:

Bouillon, creamed soups or strained vegetable soup
Cream (small amount)
Sugar (small amount)
Weak tea, coffee or cocoa
Macaroni or rice
Lamb, chicken, fish or scraped beef
Pudding, custard, junket, ice cream or gelatin
Vegetable juice
Cream or cottage cheese

Midafternoon Snack

Fruit juice (strained), cocoa or candy
Crackers

Dinner:

Lamb, chicken, fish or scraped beef
Rice
Cream (small amount)
Weak tea, coffee or cocoa
Sugar (small amount)
Macaroni or rice
Vegetable juice
Pudding, custard, junket, ice cream or gelatin

Bedtime Snack

Lemonade
Crackers

SOFT, BLAND, LOW RESIDUE DIET (4)

Typical Foods Allowed:

Cereals	All fine cereals, such as Cream of Wheat, Farina, rice, cooked with or without milk; also corn-meal mush
Bread	White, plain or toasted, white crackers
Beverages	Milk, with or without cream; malted milks, eggnogs, weak cocoa, bland fruit juices reinforced with egg white, Ovaltine
Eggs	Soft-cooked, poached, shirred, soft-scrambled, omelet
Soups	Cream soups of allowed vegetables
Vegetables (puréed)	Peas, asparagus tips, carrots, Lima beans, beets, squash, pumpkin, string beans Potatoes, baked, mashed, creamed Macaroni, spaghetti, noodles, plain or creamed Rice, boiled or creamy
Fruits (puréed)	Applesauce or baked apple with skin and core removed, canned peaches, pears, apricots, prunes (use fine sieve to purée fruit)
Tender Meats	Scraped beef Sweetbreads, broiled or creamed White meats of chicken, baked, stewed or creamed Fresh whitefish, baked, steamed or creamed Lamb or broiled tenderloin of beef—occasionally Oyster stew puréed
Cheese	Cottage or Philadelphia cream cheese
Desserts	Plain Jello, junket, custard, plain vanilla ice cream, simple puddings, such as cornstarch, rice, bread, tapioca, snow pudding
Salt	Allowed in moderation, but pepper omitted entirely
Butter and Cream	As desired

Typical Foods to Avoid:

Highly seasoned foods and sauces, such as catsup, vinegar, mustard, pepper, condiments of all sorts; bran or coarse-fibered or gaseous, flatulent foods (vegetables, fruits or cereals) ; rich pastries, hot breads, griddle cakes, waffles

SOFT, BLAND, LOW RESIDUE DIET (4) (*Continued*)

Breakfast:

Fruit juice (preferably strained)
Eggs, any style
Bland cereal (Farina, rice flakes, oatmeal, etc.)
Cream
Sugar
Toasted white bread
Butter (moderate amount)
Coffee or cocoa

Midmorning Snack

Fruit juices, cocoa or broth
Crackers

Luncheon:

Bouillon, creamed soups or strained vegetable soup
Cream (small amount)
Sugar (small amount)
Weak tea, coffee or cocoa
Potatoes, macaroni, rice or puréed vegetables, well cooked and strained
Lamb, chicken, fish or scraped beef
Pudding, custard, junket, ice cream or gelatin
Cream or cottage cheese

Midafternoon Snack

Fruit juices, cocoa or candy
Crackers

Dinner:

Lamb, chicken, fish or scraped beef
Rice
Cream (small amount)
Weak tea, coffee or cocoa
Sugar (small amount)
Potatoes, macaroni, rice or puréed vegetables, well cooked and strained
Pudding, custard, junket, ice cream or gelatin
Stewed fruits without skins or seeds

Bedtime Snack

Lemonade
Crackers

LIGHT, BLAND DIET (5)

Breakfast:
- Fruit, cooked (no raw fruits)
- Cereal
- Bacon or egg
- Toast
- Butter
- Cream
- Sugar
- Tea, coffee or coffee substitute

Dinner:
- Clear soup
- Meat:
  - Lamb or broiled tenderloin of beef
- Potato, baked or mashed
- Vegetable (cooked) *
- Salad (no raw fruits)
- Bread
- Butter
- Dessert
- Tea, coffee or coffee substitute

Supper:
- Soup
- Egg or egg substitute
- Potato, baked or mashed
- Vegetable (cooked) *
- Salad (no raw fruits)
- Bread
- Butter
- Dessert
- Tea, coffee or coffee substitute

GENERAL DIET (6)

Breakfast:
- Fruit, raw or cooked
- Cereal
- Bacon or egg
- Toast
- Butter
- Cream
- Sugar
- Tea, coffee or coffee substitute

Dinner:
- Clear soup
- Meat
- Potato
- Vegetable
- Salad
- Bread
- Butter
- Dessert
- Tea, coffee or coffee substitute

Supper:
- Soup
- Egg or egg substitute
- Potato
- Vegetable
- Salad
- Bread
- Butter
- Dessert
- Tea, coffee or coffee substitute

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* For vegetables for bland diet, see page 712.

Preoperative and Postoperative Dietary Management*

PREOPERATIVE FEEDING
POSTOPERATIVE FEEDING
SURGERY OF STOMACH AND DUODENUM
SURGERY OF THE GALLBLADDER AND THE BILIARY TRACT
SURGERY OF THE COLON
DIETARY MANAGEMENT FOR PATIENTS WITH COLOSTOMY
SURGERY OF THE RECTUM
SPECIAL METHODS OF FEEDING

PREOPERATIVE FEEDING

In all operations nothing is administered by mouth for at least six hours prior to the time of operation. The stomach should be empty at the time of surgery so as to avoid the possibility of aspiration of vomitus during anesthesia or while the patient is recovering from it. Food retained in the stomach at the time of operation may interfere seriously with the technical part of the surgical procedure. It also increases the possibility of postoperative gastric retention, gastric dilatation and vomiting. In emergency operations therefore it is best to aspirate the stomach with a tube before the anesthetic is administered. Postoperative distention may be reduced or avoided by emptying the colon the evening before surgery with a good cleansing enema.

There should be no deficit of fluids. If the patient is dehydrated or in acidosis or alkalosis, suitable parenteral solutions must be administered.

When no special diet is indicated due to the disease itself, the best diet for building up the patient's general condition is one high in carbohydrate and moderately high in protein (see diets for liver disease, pp. 500 to 505). In some instances such a diet should be maintained from seven to ten days, and a liberal amount of vitamins in therapeutic doses should be given for from five to ten days before surgery.

POSTOPERATIVE FEEDING

When nutrition has not been impaired before operation, patients suffer no great loss in two days of abstinence from semisolid and solid foods. The author prefers to withhold water until active peristalsis is heard after uncomplicated abdominal operations. Fluids and nourishment during this period are administered parenterally. When active peristalsis has been heard, water is ordered in small amounts, usually an ounce an hour for the first four hours. The amount of water is gradually increased until unrestricted quantities are retained. On the second day after operation, clear fluids such as tea and broth are added to the diet. Milk and fluids containing large amounts of carbohydrates, such as orange juice, are to be avoided generally for the first two days after operation. Usually by the third day a semisolid, low residue (No. 3), to a soft, bland, low residue (No. 4) diet is well tolerated (pp. 675 to 677). An enema is ordered at this time unless contraindicated by inflammatory lesions of the lower bowel. Laxatives are ordered as necessary. On the fifth day, a light, bland (No. 5) to general diet (No. 6) is usually well tolerated.

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* The reader is referred throughout this chapter to diets outlined either under a specific disease or in the chapter on routine hospital diets.

There is apt to be a noticeable loss of weight, even though fluids are provided in adequate amounts, associated with two days of starvation after operation. Though this may be almost prevented by parenteral alimentation, patients who are weak and emaciated require special care, which usually includes intravenous administration of blood or plasma, glucose and protein hydrolysates. Some cases may need special gastrostomy or jejunostomy feedings. Prolonged nausea, vomiting, abdominal distention, acute dilatation of stomach, hiccough, pulmonary complications and infections may require further changes in the feeding program.

Postoperative Nausea and Vomiting

General anesthesia and spinal anesthesia are frequently followed by nausea and vomiting. Sometimes they may even occur after local anesthesia which may be used for trivial operative procedures. It is wise to withhold food for six hours before operation and thus minimize the amount of gastric residue. Since nausea and vomiting may occur after any type of anesthesia, it is best to withhold all feeding by mouth for from twelve to twenty-four hours following abdominal surgery. Administration of water is begun cautiously only after peristalsis has been heard by the aid of the stethoscope. Thorough gastric lavage is the best treatment for nausea and vomiting. For this purpose, an ordinary Levin tube is inserted through the nose into the stomach. The stomach is alternately flushed and aspirated with warm water or physiologic saline solution until the returns are clear. Following such a procedure, patients are usually relieved of nausea. If nausea and vomiting recur, they are best overcome by the use of continuous suction drainage. After gastro-intestinal surgery and in peritonitis, it is good practice to insert an indwelling nasal tube for continuous suction drainage immediately after operation, thus avoiding nausea, vomiting, abdominal distention, acute dilatation of the stomach and hiccough.

Postoperative Abdominal Distention

One of the frequent postoperative sequelae is abdominal distention. Due to improvements in preoperative and postoperative care, anesthetic technic and greater gentleness in handling tissues at surgery, its incidence is steadily diminishing. In the prevention and the treatment of abdominal distention, it is well to remember the influence of certain foods that are apt to create gas, such as orange juice and ginger ale, as well as to recognize the equally vital role of swallowed air. The higher the glucose content of carbohydrate foods, the more gas is likely to form. Milk is capable of causing significant distention in certain patients, also foods rich in cellulose and legumes, such as bean purées. Pure proteins, fats and certain carbohydrates, such as toast, gruel or macaroni, are not sources of gas. Liquids and carbohydrates in the immediate postoperative period can best be furnished by the parenteral administration of dextrose solutions. The re-establishment of normal peristalsis in the bowel is better initiated by resorting to semisolid or solid foods, such as toast, cooked cereals, egg albumin and other nongas producers. These foods generally may be taken safely within a reasonable time after nausea and vomiting have subsided. The need for vitamin C can be met by the administration of ascorbic acid, at first parenterally and later by mouth, which likewise is of value in wound healing. Much can be done both preoperatively and in the immediate postoperative period to prevent the occurrence of distention. In the preoperative period, dehydration is overcome and cathartics should be prohibited. During the induction of a general anesthetic, a great deal of air may be swallowed, particularly if the induction is prolonged and attended by gagging and struggling. Distention usually becomes manifest on the second day after operation. Cramp-like, colicky pains, the so-called gas pains, usually accompany the distention. Loosening a constricting swathe often affords relief. In addition, one may turn the patient from side to side. This may relieve the pressure and it often aids in propulsion of gas. Radiant heat may be applied to the abdomen and a rectal tube may be inserted into the rectum and left for varied intervals as an aid in the expulsion of gas.

Acute Dilatation of the Stomach

Symptoms of acute dilatation of the stomach usually develop between twenty-four and forty-eight hours after operation. Vomiting becomes persistent and shortly thereafter there is enlargement of the stomach, often enormous. As the condition progresses, the vomiting becomes practically continuous, so that there is almost a constant regurgitation of brown or brownish-green fluid from the mouth. A toxemia develops, with rapid pulse, shallow respiration, terrific thirst, dehydration and scanty urine. Collapse and even death by shock may occur in untreated cases.

When recognized promptly, the passage of the stomach tube will relieve the most acute symptoms. Either repeated gastric aspirations or continuous suction aspiration is instituted. Fluid requirements must then be maintained by the parenteral route.

As a result of the routine use of gastric lavage when vomiting persists beyond the usual postanesthetic stage, acute dilatation of the stomach is often prevented. The suction-siphonage apparatus of Wangensteen serves admirably.

Postoperative Hiccough

Ordinarily, postoperative hiccough causes little anxiety and, as a rule, is transitory, responding to symptomatic treatment. When it is refractory to treatment and becomes protracted, the added drain on the reserve strength of an already debilitated patient may be a deciding factor in the balance between recovery and death.

Innumerable remedies are recommended for the treatment of hiccough. They include physical measures, such as holding one's breath, drinking water while holding the breath, traction upon the tongue, compression of the costal margins, pressure on the neck in the region of the fifth cervical vertebra, pressure on the eyeballs, flexion of the thighs on the abdomen and many others. Various sedatives and antispasmodics have been used, such as bromides, benzyl benzoate, the barbiturates, chloral, atropine, belladonna, paraldehyde, compound spirits of ether, hyoscine, morphine, any one of which may be of some value.

During the past few years, the inhalation of carbon dioxide combined with 10 per cent oxygen has proved to be a very efficient remedy. The gas may be administered by means of a mask and some type of anesthetic machine. Very satisfactory results are often obtained by the patient's breathing for from three to six minutes into a paper bag, which is held in such manner that it tightly encloses the mouth and the nose. In this way the patient rebreathes an atmosphere, the carbon-dioxide content of which steadily rises. Inasmuch as hiccough is a disorder with a varied and poorly defined etiology, the array of remedies listed above can be readily understood.

SURGERY OF STOMACH AND DUODENUM

The preoperative feeding has been outlined at the beginning of this chapter. The postoperative diets for ulcer of the stomach and the duodenum are outlined on pages 314 to 317.

SURGERY OF THE GALLBLADDER AND THE BILIARY TRACT

In the simple, chronic calculus cholecystitis uncomplicated by jaundice, and with the patient in fairly good nutrition, there is no necessity for unusual preoperative care other than a high protein, high carbohydrate, low fat intake for a few days prior to surgery. The dietary regimen for the patients with acute calculus cholecystitis is discussed on page 513, chapter on gallbladder disease.

The preoperative preparation of patients with associated liver disease is of the utmost importance, particularly if the patient has a history of intermittent or prolonged jaundice.

The preoperative regimen has two purposes: first, to repair and protect the damaged hepatic cells and, second, to combat any actual or impending hemorrhagic tendencies due to the interruption of the normal blood-clotting mechanism. The hepatic cells are repaired and afforded protection by the administration of a high protein, high carbohydrate, low fat diet, page 508, in the chapter on liver disease, in amounts which exceed the caloric requirements of the individual.

The danger in biliary surgery lies mainly in the fact that operation adds further liver damage. The anesthesia may cause liver damage. The period of semistarvation immediately following surgery probably adds further liver damage. In order to give the liver maximum protection against damage, the diet should be high in protein, high in carbohydrate and low in fat.

Emphasis has been placed on such high protein foods as the white of egg, lean broiled beef, liver, white meat of chicken and cottage cheese, and on such high carbohydrate foods as hard candies, fruit juices, bread, jelly, banana, 10 and 20 per cent carbohydrate vegetables, skimmed milk and cereals.

Hemorrhagic tendencies are overcome by the feeding of vitamin K and bile salts or the parenteral administration of a water-soluble vitamin preparation.

SURGERY OF THE COLON

Diet is especially important in the preparation of patients for surgery of the colon. Such patients are generally poorly nourished, even if they have only partial obstruction when admitted to the hospital. They have usually reduced their food intake because of abdominal pain and distention; as a result, they are dehydrated and have lost weight and strength. In cases with lesions of the right side of the colon, there is generally a hypochromic, microcytic anemia.

If immediate operation is undertaken, the intestine above the obstruction will be found to be greatly distended and filled with feces. The bowel wall is apt to be thin and edematous as a result of trauma from its efforts to move the large amount of fecal matter through a restricted lumen, and also as a result of distention and possibly of secondary infection in a wall whose resistance to such infection has been reduced.

In surgery of the colon, the principal purposes of diet are to overcome obstruction, distention, edema, inflammation of the bowel wall and dehydration. The reduction of edema and infection results in lessening the degree of obstruction. A carefully selected diet reduces the amount of fecal material in the colon. Such a diet is outlined on page xx. This nonresidue, full diet (1 B) not only rehabilitates the diseased bowel but overcomes dehydration and produces a gain in weight. Succinylsulfathiazole (sulfasuxidine) or sulfathaladine, can be administered and tends to reduce the flora of the large bowel.

Careful preoperative preparation of those to undergo surgery of the colon reduces not only the difficulty of the surgical procedure but the operative mortality. From four to six days are required for adequate preparation of the bowel. The patient must be watched closely during this period, for occasionally the obstruction becomes complete, owing to the nature of the lesion. If complete obstruction is present, decompression must be established with a Miller-Abbott double lumen tube or with a preliminary cecostomy, or colostomy, as the case demands. If a Miller-Abbott tube is inserted, patients with incomplete or partial obstruction may sometimes be carried a week or longer until their nutritional status is improved. The diet should be a nonresidue, full (1 B) to semisolid, low residue diet (No. 3), so that the semiliquid residue of the lower small bowel can be aspirated through the distal lumen of the tube.

Postoperative dietary management following surgery of the colon varies with the type of procedure (Table 19). In general, fluid, salt, glucose, protein hydrolysates and vitamins are administered intravenously on the day of operation and on each day thereafter until peristalsis is heard. Nonresidue liquids may be allowed as they are tolerated, beginning with the second day after operation except in cases of ileocolostomy, primary resection or closure of colostomy. In these, they are withheld until the fourth day after operation. When the efferent loop of bowel is temporarily obstructed by the operative procedure, the nonresidue liquid diet is continued until the loop of bowel is opened, then the semisolid, low residue diet (No. 3) is begun and slowly thereafter increased as the condition of the patient permits.

In procedures involving primary resection or closure of the bowel, every effort is made to prevent strain on the suture lines. Parenteral alimentation feedings are continued until the fourth day after operation, when nonresidue, liquid diet (1 A) is offered. Water is given to the patient at a rate of an ounce an hour. If this is tolerated for several hours, the remaining nonresidue liquids are allowed. On the sixth day, after operation a nonresidue full diet (1 B) is begun and, on the eighth, a semisolid, low residue diet (No. 3). After the twelfth day, foods are added to the soft, bland, low residue diet (No. 4) as tolerated. It must be remembered that, though outlines such as that given in Table 19 are very useful, they must be altered to meet the requirements of each patient.

When a Miller-Abbott double lumen

tube has been used and left in place with the balloon deflated, the patient can be given a soft, bland, low residue diet (No. 4) on the fourth or the fifth day. The continuous aspiration of the distal lumen of the tube and the subsequent removal of the liquid fecal stream from the terminal small bowel aid in the prevention of gaseous distention of the proximal colon.

DIETARY MANAGEMENT FOR PATIENTS WITH COLOSTOMY

The importance of the proper care and dietary management of a colostomy cannot be overemphasized. The action of the colostomy, whether it is permanent or temporary, is always foremost in the patient's mind. If the fecal stream is to be controlled, the diet must be chosen with care and discretion. Foods producing excessive gas or tending to produce diarrhea must be avoided. A patient with a colostomy should be kept in a mild state of constipation. At first, foods should be restricted to the semisolid, low residue foods (No. 3). Such a diet should reduce the number of stools and the amount of flatulence. Eating between meals is to be avoided. Care of the colostomy is equally important. Every patient should be taught to care for his colostomy.

When the movements are well controlled, a more extensive diet is allowed, from a soft, bland, low residue diet (No. 4) to a light, bland diet (No. 5). To the list of foods allowed, the patient slowly adds the residue-containing foods. At the first sign of loose movements or diarrhea, these must be avoided again. The patient should be advised to add only one food at a time and observe the effect it has on him. A carefully planned diet, modified to meet individual needs, will usually control the fecal discharge from a colonic stoma.

SURGERY OF THE RECTUM

In rectal operations, such as hemorrhoidectomy and excision of anal fistula, no preoperative dietary restrictions are necessary. The patient merely takes a cleansing enema the evening before the operation and a second one early on the day of operation. Since patients undergoing rectal operations usually receive local, spinal or caudal anesthesia, they are able to take a liquid diet immediately after operation. Paregoric, one dram four times a day, may be given to ensure against rectal irritation by fecal material. On the morning of the third day after operation in such instances, the paregoric is discontinued and a soft, bland, low residue diet (No. 4) is then followed. The fecal stream is then kept soft by the daily administration of mineral oil.

To prevent irritation of the wound by fecal material, the patient is instructed to sit for twenty minutes twice each day in a tub with a few inches of warm water in it. The application of warm witch-hazel compresses may be helpful. The compresses, in addition to cleansing the external surfaces, serve to reduce pain. In extensive operations for fecal fistula, the liquid diet (No. 2) and paregoric may be continued for from four to six days. When desirable, a nonresidue, full diet (No. 1 B) may be prescribed and stools prevented for as long as two or three weeks.

TABLE 19

DIETARY REGIMENS FOLLOWING VARIOUS OPERATIONS ON THE COLON

The following dietary regimens generally are used subsequent to the more common or representative surgical procedures indicated. However, there are no routine measures and patients are considered individually.

Colostomy

Nonresidue liquid (1 A) until exteriorized loop of bowel is opened.

Semisolid, low residue diet (No. 3) after loop of bowel is opened.

Soft, bland, low residue diet (No. 4) increased as tolerated.

Ileocolostomy

Nonresidue liquid (1 A) beginning fourth day after operation.

Nonresidue, full diet (1 B) sixth or seventh day after operation.

Semisolid, low residue diet (No. 3) eighth or ninth day after operation.

Soft, bland, low residue diet (No. 4) twelfth day after operation.

Posterior Resection

Nonresidue liquid (1 A) beginning second day after operation.

Semisolid, low residue diet (No. 3) as tolerated, third day after operation.

Soft, bland, low residue diet (No. 4) increased as tolerated.

Extraperitoneal Resection

Nonresidue liquid (1 A) until exteriorized loop of bowel is opened.

Semisolid, low residue diet (No. 3) after loop of bowel is opened.

Soft, bland, low residue diet (No. 4) increased as tolerated.

Combined Abdominoperineal Resection

Nonresidue liquid (1 A) beginning second day after operation.

Semisolid, low residue diet (No. 3) as tolerated, third day after operation.

Soft, bland, low residue diet (No. 4) increased as tolerated.

Mikulicz or Rankin Obstructive Resection

Nonresidue liquid (1 A) until exteriorized loop of bowel is opened.

Semisolid, low residue diet (No. 3) after loop of bowel is opened.

Soft, bland, low residue diet (No. 4) increased as tolerated.

Anterior Resection with Colostomy

Nonresidue liquid (1 A) until exteriorized loop of bowel is opened.

Semisolid, low residue diet (No. 3) after loop of bowel is opened.

Soft, bland, low residue diet (No. 4) increased as tolerated.

Closure of Colonic Stoma

Nonresidue liquid (1 A) beginning fourth day after operation.

Nonresidue, full diet (1 B) sixth or seventh day after operation.

Semisolid, low residue diet (No. 3) eighth or ninth day after operation.

Soft, bland, low residue diet (No. 4) twelfth day after operation.

See Routine Hospital Diets, pages 672 to 678.

(1 A) Nonresidue liquids are limited to strained fruit juices, gelatin made with fruit juices, and clear tea, coffee and broth

(1 B) Nonresidue, full diet

(3) Semisolid, low residue diet

(4) Soft, bland, low residue diet

The only difference between the semisolid, low residue diet and the soft, bland, low residue diet is that the soft, bland, low residue adds puréed vegetables and potatoes and puréed fruits.

The only difference between a light, bland diet and a general diet is that there are no raw fruits in the light, bland diet and the meat is restricted to lamb, broiled tenderloin of beef, chicken or fish. In addition, the vegetables are limited to the list of nongaseous, flatulent vegetables. See page 454 for flatulent foods and page 712 for typical foods allowed and those avoided in any condition requiring a bland diet.

SPECIAL METHODS OF FEEDING

There are certain conditions which require special methods of administering nourishment. Tube feeding either by nasal or stomach catheter or the giving of food through artificial stomach openings may be the only means by which nourishment can be maintained unless intravenous methods are resorted to. In tube feeding one may give sufficient calories, fluid and protein, as well as minerals and vitamins, to support the body's needs. The material used in the diet outlined on page 686 is finely divided and easily digested and contains approximately 2,100 calories with 2,000 cubic centimeters of fluid.

Also presented are two formulae for gastrojejunal feedings, one devised by Scott and Ivy and the other devised by the author and used by him with much success. These formulae are adequate in all the essential food requirements.

60 Gm. Protein
2,100 Calories

SUGGESTED DISTRIBUTION OF TOTAL FOOD ALLOWANCE FOR ONE DAY

			Gm.
A.M. 8:00	Cereal gruel		
	Cooked cereal (strained)	½ cup	105
	Milk	½ cup	120
	Cream	About ½ cup	100
	Salt		
	Sugar or lactose	2 tablespoons	30
	Orange juice	¼ glass	50
10:00	Eggnog:		
	Egg	1	50
	Milk	1 cup	240
	Sugar or lactose	1 tablespoon	15
	Orange juice	¼ glass	50
M. 12:00	Cream soup:		
	Strained vegetables	½ cup	100
	Milk	½ cup	120
	Cream	About ½ cup	100
	Salt		
	Orange juice	¼ glass	50
P.M. 3:00	Eggnog:		
	Egg	1	50
	Milk	1 cup	240
	Sugar or lactose	1 tablespoon	15
	Orange juice	¼ glass	50
6:00	Cream soup:		
	Strained vegetables	½ cup	100
	Milk	½ cup	120
	Cream	About ½ cup	100
	Salt		
	Orange juice	¼ glass	50
8:00	Eggnog:		
	Egg	1	50
	Milk	1 cup	240
	Sugar or lactose	1 tablespoon	15

NOTE: All feedings should be strained through a fine sieve and served at body temperature.

DIRECTIONS FOR SCOTT AND IVY FORMULA FOR TUBE FEEDINGS IN JEJUNOSTOMY

Water	1½ quarts
Sugar	5 tablespoonfuls
Peptone (50 Gm.)	6 tablespoonfuls dried peptone
Wheat flour	1 cup
Milk	1 quart
Cream	1 pint

Dissolve the sugar in the warm water. To this add the peptone. After both the sugar and the peptone have been thoroughly dissolved in the water, the solution is heated to 60° C. for several minutes. A paste is made with the flour and the water and gradually all the peptone-sugar solution is added. The milk and the cream are then added and the entire mixture is brought to boiling point quickly over a hot flame, but not allowed to boil. The mixture must be stirred vigorously and continuously during heating to prevent burning. It is kept at a sub-boiling point until it thickens to the consistency of a thick cream soup or thin flour-paste mixture. The mixture is then cooled and placed in the ice box. If kept at ice-box temperature, the food will keep in good condition four or five days at least.

In feeding, the food is measured and warmed to body temperature.

To each day's amount add the following:

1 egg yolk
1 tablespoon cod-liver oil
2 yeast tablets (Brewer's yeast tablets)
1½ tablespoon tomato juice with pinch of soda added to it

Make an emulsion of the egg yolk and the cod-liver oil before adding. Beat the egg yolk and add the oil gradually one drop at a time, beating continuously.

Strain through several layers of cheesecloth.

One hundred and fifty cubic centimeters of the mixture are given every hour or every other hour when the case warrants it.

When the mixture is administered every other hour, four or five ounces of water are given between feedings to increase the fluid intake.

The 1,600 cubic centimeters of the mixture are equal to 1,300 calories, which is the approximate number of calories for this type of case.

GASTROJEJUNAL FEEDING

Formula:
Boil
1,000 cc. milk
300 cc. cream
120 cc. sugar or lactose
3 eggs
3 egg whites

Cool this mixture and add the following:

100 cc. orange juice
15 cc. cod-liver oil
3 teaspoonfuls Brewer's yeast

Strain through a very fine sieve. Serve at body temperature from 150 to 200 cc. every two hours.

Carbohydrate	195
Protein	70
Fat	160
Calories	2,500
Fluid	1,760

PART V

APPENDIX

Appendix

AVERAGE WEIGHT IN POUNDS WITH CLOTHES

Men

Feet and inches with shoes

Age	5–0	5–1	5–2	5–3	5–4	5–5	5–6	5–7	5–8	5–9	5–10	5–11	6–0	6–1	6–2	6–3	6–4	6–5
16	109	111	114	117	120	124	128	132	136	140	144	149	154	159	164	169	174	179
18	113	115	118	121	124	128	132	136	140	144	148	153	158	163	168	173	178	183
20	117	119	122	125	128	132	136	140	144	148	152	156	161	166	171	176	181	186
22	119	121	124	127	131	135	139	142	146	150	154	158	163	168	173	178	183	188
24	121	123	126	129	133	137	141	144	148	152	156	160	165	170	177	182	187	192
26	123	125	127	130	134	138	142	146	150	154	158	163	170	174	180	186	191	196
28	125	127	129	132	135	139	143	147	151	155	159	164	172	176	182	188	193	198
30	126	128	130	133	136	140	144	148	152	156	161	166	174	178	184	190	196	201
32	127	129	131	134	137	141	145	149	154	158	163	168	174	180	186	192	198	203
34	128	130	132	135	138	142	146	150	155	160	165	170	176	182	188	194	200	206
36	129	131	133	136	139	143	147	151	156	161	166	171	177	183	190	196	202	208
38	130	132	134	137	140	144	148	152	157	162	167	173	179	185	192	198	204	210
40	131	133	135	138	141	145	149	153	158	163	168	174	180	186	193	200	206	212
42	132	134	136	139	142	146	150	154	159	164	169	175	181	187	194	201	208	214
44	133	135	137	140	143	147	151	155	160	165	170	176	182	188	195	202	209	215
46	134	136	138	141	144	148	152	156	161	166	171	177	183	189	196	203	210	216
48	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
50	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
52	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	281
54	135	137	139	142	145	149	153	158	163	168	173	178	184	191	198	205	212	219

Women

Age	4–8	4–9	4–10	4–11	5–0	5–1	5–2	5–3	5–4	5–5	5–6	5–7	5–8	5–9	5–10	5–11	6–0
16	102	104	106	108	109	111	114	117	120	124	128	132	136	139	143	148	153
18	104	106	108	110	112	114	117	120	123	126	130	134	138	141	145	150	155
20	106	108	110	112	114	116	119	122	125	128	132	136	140	143	147	151	156
22	107	109	111	113	115	117	120	123	126	129	133	137	141	145	149	153	157
24	109	111	113	115	117	119	121	124	127	130	134	138	142	146	150	154	158
26	110	112	114	116	118	120	122	125	128	131	135	139	143	147	151	155	159
28	111	113	115	117	119	121	123	126	130	133	137	141	145	149	153	156	160
30	112	114	116	118	120	122	124	127	131	134	138	142	146	150	154	157	161
32	113	115	117	119	121	123	125	128	132	136	140	144	148	152	155	158	162
34	115	117	119	121	123	125	127	130	134	138	142	146	150	154	157	160	163
36	116	118	120	122	124	126	128	131	135	139	143	147	151	155	158	161	164
38	117	119	121	123	125	127	130	133	137	141	145	149	153	157	160	163	166
40	119	121	123	125	127	129	132	135	138	142	146	150	154	148	161	164	167
42	120	122	124	126	128	130	133	136	139	143	147	151	155	159	162	166	169
44	122	124	126	128	130	132	135	138	141	145	149	153	157	161	164	168	171.
46	123	125	127	129	131	133	136	139	142	146	150	154	158	162	165	169	172
48	124	126	128	130	132	134	137	140	143	147	152	156	160	164	167	171	174
50	125	127	129	131	133	135	138	141	144	148	152	156	161	165	169	173	176
52	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
54	125	127	129	131	133	135	138	141	144	148	153	158	163	167	171	174	177

Food Composition Table for Short Method of Dietary Analysis*

Food	Approximate Measure	Weight (Gm.)	Calories	Protein (Gm.)	Fat (Gm.)	Carbohydrate (Gm.)	Ca (Gm.)	P (Gm.)	Fe (Mg.)	Vitamin A (I. U.)	Ascorbic Acid (Mg.)	Thiamine (Mg.)	Riboflavin (Mg.)	Niacin (Mg.)
Cereal products: refined	1 sl. bread (30 Gm.); ½ c. cooked cereal and cereal products (20 Gm. dry); 1 c. prep. cereal (30 Gm.); 3 soda crackers (20 Gm.); 1½ c. popcorn (20 Gm.); 1 griddle cake	......	80	2.5	1	15	.01	.03	.2	......	......	.02	.02	.2
whole grain and enriched	1 sl. bread (30 Gm.); ½ c. cooked cereal (20 Gm. dry); 1 c. prep. cereal (30 Gm.); 2 graham crackers (20 Gm.)	......	80	2.5	1	15	.01	.04	.6	......	......	.06	.04	.6
Dairy products: butter	1 tsp.	5	35	......	4	......	......	......	......	160	......	......	......	......
cheese, Cheddar type	1 cu. in.	30	120	7.0	10	1	.25	.18	.3	430	......	.01	.14	......
cheese, cottage, skim	½ c.	100	100	19.0	1	4	.08	.26	.2	70	......	.01	.13	......
cream, light	⅛ c.	30	60	1.0	6	1	.03	.02	.1	360	......	.01	.04	......
custard	½ c.	130	150	7.0	7	15	.13	.14	.9	435	......	.08	.26	.1
eggs	1 med.	50	80	6.5	6	......	.03	.10	1.4	495	......	.07	.18	......
ice cream, commercial	⅔ c.	80	165	3.0	10	16	.06	.05	.1†	265	......	.02	.21	.1
milk, buttermilk, skim	1 c.	240	90	8.5	1	12	.29	.23	.2†	25	2	.11	.43	.2
milk, whole	1 c.	240	160	8.5	9	12	.28	.22	.2†	410	2	.10	.43	.3
Desserts: cake, plain, chocolate	1 piece cake 2½×2½×2½ in. (75 Gm.), for iced add 1 serving sweets; 1 waffle 6 in. dia. (60 Gm.)	......	225	4.0	11	28	.23	.06	.8	175	......	.09	.11	.6
cookies, plain	2 med. 3 in. dia.; 1 brownie	40	150	2.0	7	20	.01	.03	.3	155	......	.04	.03	.2
pie crust	⅙ shell, single crust	25	105	1.5	6	11	......	.02	.4	......	......	.06	.04	.5
puddings, cream fillings	½ c.	140	210	4.5	6	35	.16	.13	.6	230	......	.06	.22	.1
Fats	2 sl. bacon (20 Gm.); 1 tbsp. fat (12 Gm.); 1 tbsp. mayonnaise (15 Gm.); 1 cu. in. salt pork (15 Gm.); 1½ tbsp. French dressing (15 Gm.)	......	120	1.0	13	......	......	.01	.2	5	......	.01	.01	.2
Fish: cod, haddock, fresh, cooked	1 med. serving	75	50	12.5	......	......	.01	.14	1.5	......	......	.05	.06	.8
halibut, herring, tuna, whitefish, cooked	1 med. serving; tuna (60 Gm.); others (75 Gm.)	......	105	15.0	5	......	.02	.17	.8	35	......	.04	.08	2.4
salmon, canned	1 med. serving	75	125	15.5	7	......	.05	.22	.7	220	......	.02	.12	5.9

Fruits: banana	1 small	100	95	1.0	......	23	.01	.03	.6	350	10	.04	.07	
cantaloupe	½ melon, 4½ in. dia.	150	35	1.0	......	8	.02	.02	.6	3,600	52	.08	.08	.1
citrus	1 med. orange; ½ med. grapefruit; ½ c. juice; 1 med. large lemon	100	50	1.0	......	11	.02	.02	.4	180	42	.07	.03	.2
yellow, fresh, canned, dried	fresh (100 Gm.): 1 med. peach, 2 to 3 apricots, 3 plums; dried (30 Gm.), add ½ serving sweets; for sweetened canned, dried or fresh, add 1 serving sweets	......	55	.5	......	13	.01	.02	.4	585	4	.01	.02	.6
other, dried	3 to 4 dates; 1½ to 2 small figs; dried apple; ¼ c. raisins	30	90	.5	......	22	.02	.03	.9	30	1	.04	.03	.2
other, fresh and canned	c. cooked; sweetened, add 1 serving sweets	100	65	.5	......	15	.01	.01	.4	80	6	.02	.02	.1
Gravy; white sauce	¼ c.	60	70	2.5	5	4	.05	.05	.2	180	......	.04	.11	.1
Legumes: beans, peas	½ c. cooked; dried (30 Gm.)	......	105	6.5	......	19	.03	.12	2.4	20	......	.14	.06	.5
soybeans	½ c. cooked; dried (30 Gm.)	......	105	10.5	5	4	.07	.18	2.5	55	......	.24	.10	.8
Meat: beef, fowl, lamb, veal, cooked	1 med. serving	75	160	18.0	10	......	.01	.18	3.1	20	......	.09	.15	3.9
liver, cooked	1 small serving	60	80	12.0	2	4	.01	.22	4.9	16,500	9	.12	1.22	6.0
luncheon meats, cooked	2 sl. sausage, minced ham, dried beef, luncheon roll (30 Gm.); ½ frankfurter (30 Gm.)	......	80	5.0	6	1	......	.06	.7	......	......	.09	.07	.8
pork; ham, cooked	1 med. serving	75	205	18.0	15	......	.01	.18	2.4	......	......	.60	.15	3.2
Nuts	1 tbsp. peanut butter; 8 to 15 halves walnuts; 16 peanuts; 12 to 15 almonds; 12 halves pecans	15	95	3.5	8	3	.01	.06	.3	......	......	.03	.02	1.4
Sweets: candy, sugar, sirup	1 tbsp. sugar, jelly, jam, sirup, honey; 1 serving plain Jello; plain candy (fondant or mints, 14 Gm.); 6-oz. bottle soft drink	......	55	......	......	14	......	......	......	......	......	......	......	....
candy bar	1 2-oz. chocolate-coated bar	......	275	5.0	13	35	.05	.10	1.4	......	......	.03	.09	3.3
molasses; sorghum	1 tbsp.	20	50	......	......	12	.04	.01	1.3	......	......	.01	.04	....
Vegetables: cabbage; sauerkraut, cooked	⅔ c.	100	25	1.5	......	5	.05	.03	.5	30	28‡	.05	.04	.2
cabbage, raw; cauliflower, cooked	1 c. cabbage (50 Gm.); ⅔ c. cauliflower (70 Gm.)	......	15	1.0	......	3	.02	.02	.3	20	26	.04	.03	.1

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* The nutritive value of food mixtures such as macaroni and cheese, Spanish rice, chow mein, creamed vegetables, soups, etc., should be computed on the basis of the kind and approximate amount of the foods in the combination.

† Revised to correspond with recent values in Misc. Pub. No. 572, U.S. Department of Agriculture (1945).

‡ For sauerkraut, omit ascorbic acid.

FOOD COMPOSITION TABLE FOR SHORT-METHOD OF DIETARY ANALYSIS (*Continued*)

Food	*Approximate Measure*	*Weight* (*Gm.*)	*Calories*	*Protein* (*Gm.*)	*Fat* (*Gm.*)	*Carbohydrate* (*Gm.*)	*Ca* (*Gm.*)	*P* (*Gm.*)	*Fe* (*Mg.*)	*Vitamin A* (*I. U.*)	*Ascorbic Acid* (*Mg.*)	*Thiamine* (*Mg.*)	*Riboflavin* (*Mg.*)	*Niacin* (*Mg.*)
Vegetables—*Continued*														
corn; parsnips, cooked	½ c. corn; 1 large parsnip	100	95	2.0	1	20	.02	.07	.4	75	6	.04	.05	.6
green and yellow; asparagus, cooked	⅔ c.	100	25	2.0	......	4	.02	.04	.9	775	38§	.14§	.11	1.0
broccoli, cooked	⅔ c.	100	35	3.5	......	6	.15	.08	1.4	4,800	63	.08	.28	.6
carrots, cooked	⅔ c.	100	40	1.0	......	9	.04	.04	.8	12,000	3	.04	.06	.5
green beans, cooked	½ c.	100	40	2.5	......	8	.06	.04	1.4	480	13§	.06§	.12	.4
leafy green, cooked	⅔ c. kale, spinach, turnip, other greens	100	30	2.5	......	4	.25‖	.05	2.7	6,285	46§	.08§	.27	.5
peas, fresh, cooked, canned	½ c.	100	70	4.5	......	12	.02	.09	1.4	590	11§	.15§	.09	1.1
sweet potato, cooked	½ large	100	130	2.0	1	28	.04	.05	.7	5,920	14	.08	.06	.5
potato, cooked	1 small; for fried add 1 serving fats	100	85	2.0	......	19	.01	.05	.7	35	8	.08	.03	1.0
tomato, fresh, canned, juice	½ c.; 1 small tomato (100 Gm.); 2½ tbsp. catsup (50 Gm.) add ½ serving sweets	......	20	1.0	......	4	.01	.02	.6	990	19	.05	.03	.7
other, cooked	½ c. beets, eggplant, onions, rutabagas, etc.	100	45	1.5	......	10	.04	.04	.6	......	8	.01	.02	.2
other, commonly served raw	2 pieces celery; 8 sl. cucumber; ⅛ hd. lettuce	50	10	0.5	......	2	.02	.01	.2	70	3	.03	.02	.1

§ For canned, reduce ascorbic acid and thiamine by one half.

‖ Calcium unavailable in chard, spinach and beet greens.

Nutritive Value of 100 Grams of Selected Foods, Edible Portion†

FOOD ITEM	WATER	FOOD ENERGY	PROTEIN	FAT	CARBOHYDRATE	CALCIUM	PHOSPHORUS	IRON	VITAMIN A VALUE	THIAMINE	RIBOFLAVIN	NIACIN	ASCORBIC ACID
MILK, CREAM, ICE CREAM, CHEESE													
Milk:	*Per Cent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milligrams*	*Milligrams*	*Milligrams*	*International Units*	*Milligrams*	*Milligrams*	*Milligrams*	*Milligrams*
1. Buttermilk, cultured	90.5	35	3.5	0.1	5.1	(118)	(93)	(0.07)	(Trace)	(0.04)	(0.18)	(0.1)	(1)
2. Chocolate flavored[1]	83.0	75	3.2	2.2	10.6	109	91	.07	90	.03	.16	.1	0
3. Condensed, sweetened	27.0	327	8.1	8.4	54.8	273	228	(.20)	(430)	(.05)	(.39)	(.2)	(1)
4. Dry skim	3.5	359	35.6	1.0	52.0	1,300	1,030	.58	(40)	.35	1.96	1.1	7
5. Dry whole	3.5	496	25.8	26.7	38.0	949	728	.58	1,400	.30	1.46	.7	6
6. Evaporated, unsweetened	73.7	139	7.0	7.9	9.9	243	195	.17	400	.05	.36	.2	1
7. Fresh skim	90.5	35	3.5	.1	5.1	(118)	(93)	(.07)	(Trace)	.04	(.18)	(.1)	(1)
8. Fresh whole	87.0	69	3.5	3.9	4.9	118	93	.07	(160)	.04	.17	.1	1
Cream; ice cream													
9. Cream (20 per cent), sweet or sour	72.5	208	2.9	20.0	4.0	(97)	(77)	(.06)	(830)	(.03)	(.14)	(.1)	(1)
10. Ice cream, plain[1]	62.0	210	4.0	12.3	20.8	132	104	.10	540	.04	.19	.1	Trace
Cheese:													
11. Cheddar type	39	393	23.9	32.3	1.7	873	610	(.57)	1,740	.04	.50	(.2)	(0)
12. Cottage	74.0	101	19.2	.8	4.3	82	263	(.46)	(30)	.02	.29	(.1)	(0)
13. Cream	53.3	367	7.1	36.9	1.7	(298)	(208)	(.17)	2,210	(.01)	.14	.1	(0)
14. *Processed, canned[2]	37.5	382	21.9	31.8	2.0	716	831	.76	1,260	.03	.43	.1	(0)
15. All other	(39)	393	(23.9)	(32.3)	(1.7)	(873)	(610)	(.57)	2,050	.04	.52	.2	(0)
FATS, OILS													
16. *Army spread, canned[3]	27.8	562	5.2	56.7	7.7	244	241	.5	2,820	.03	.19	.1	0
17. *Bacon, canned	12.6	704	7.9	74	1.6	14	38	.9	(0)	.26	.10	1.5	0
18. Bacon, medium fat	20	626	9.1	65	(1.1)	13	108	.8	(0)	(.42)	(.10)	(2.1)	0
19. Butter	15.5	733	.6	81	.4	16	16	.2	[4] 3,300	Trace	.01	.1	0
20. French dressing	38.3	423	.8	39	17.3	(5)	(5)	.1	0	0	0	0	0
21. Lard, other shortening	0	900	0	100	0	0	0	0	0	(0)	(0)	(0)	0
22. Margarine with vitamin A added	15.5	733	.6	81	.4	(2)	(15)	(.2)	[5](1,980)	(0)	(0)	(0)	0

Note: Asterisk indicates Army ration component; parentheses, imputed value.

[1] Calculated from ingredients.

[2] Cheddar type.

† Misc. Pub. No. 572, U. S. Department of Agriculture.

[3] Not less than 56 per cent butter fat on dry solids basis, cheese curd, skim milk powder.

[4] Year-round average.

[5] Plain margarine is considered to have no vitamin A value.

Nutritive Value of 100 Grams of Selected Foods, Edible Portion (*Continued*)

FOOD ITEM	WATER	FOOD ENERGY	PROTEIN	FAT	CARBO-HYDRATE	CALCIUM	PHOS-PHORUS	IRON	VITAMIN A VALUE	THIAMINE	RIBO-FLAVIN	NIACIN	ASCORBIC ACID
FATS, OILS—*Continued*	*Per Cent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Inter-national Units*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*
23. Mayonnaise	16	720	1.5	78	3.0	(19)	(60)	(1.0)	(210)	(0.04)	(0.04)	(0)	(0)
24. Salad dressing	44.7	391	1.1	36.8	13.9	(9)	(30)	(.4)	(140)	(.02)	(.03)	(0)	(0)
25. Salad or cooking oil	0	900	0	100	0	0	0	0	0	0	0	0	0
26. Salt pork, fat	8	781	3.9	85	0	2	42	.6	(0)	(.18)	(.04)	(.9)	0
EGGS													
27. Egg yolk, fresh	49.4	355	16.3	31.9	.7	147	586	7.2	3,210	.32	.52	....	0
28. *Eggs, whole, dried	2	593	(48.2)	(43.3)	(2.6)	187	800	8.7	4,460	.35	1.23	.2	0
29. Eggs, whole, fresh	74.0	158	12.8	11.5	.7	54	210	2.7	1,140	.12	.34	.1	0
MEAT, POULTRY, FISH													
Beef:													
Thin—Utility, Grade C													
30. Carcass; side, including kidney fat	66	201	18.8	14	0	11	203	2.8	(0)	.12	.15	5.1	0
Medium—Commercial, Grade B:													
31. Carcass; side, including kidney fat	60	268	17.5	22	0	10	189	2.6	(0)	.11	.14	4.7	0
32. Carcass trimmed to retail basis	63	235	18.2	18	0	11	196	2.7	(0)	.11	.14	4.9	0
33. *Chopped meat[6]	54	325	16.1	29	0	9	174	2.4	(0)	.10	.13	4.4	0
34. *Roasting meat[6]	67	193	18.9	13	0	11	204	2.8	(0)	.12	.15	5.1	0
35. *Stewing meat[6]	63	235	18.2	18	0	11	196	2.7	(0)	.11	.14	4.9	0
Fat—Good, Grade A:													
36. Carcass; side, including kidney fat	55	317	16.3	28	0	10	176	2.4	(0)	.10	.13	4.4	0
Very fat—Choice, Prime, Grade AA:													
37. Carcass; side, including kidney fat	47	406	13.7	39	0	8	148	2.1	(0)	.08	.11	3.7	0
Retail items:[7]													
38. Chuck roast (wholesale chuck)	65	218	18.6	16	0	11	200	2.8	(0)	.12	.15	5.0	0
39. *Corned beef, canned	57.3	232	24.4	15	0	29	113	4.0	(0)	.02	.19	2.7	0
40. Corned beef, medium	54.2	288	15.8	25	0	9	170	2.4	(0)	.05	.10	1.7	0
41. Dried or chipped	47.7	194	34.3	6.3	0	20	370	5.1	(0)	.11	.22	3.7	0

42. Hamburger	55	316	16	28	0	9	172	2.4	(0)	.10	.13	4.3	0
43. Loin steaks (wholesale loin)	57	293	16.9	25	0	10	182	2.5	(0)	.10	.13	4.6	0
44. Rib roast or steak (wholesale rib)	59	277	17.4	23	0	10	188	2.6	(0)	.11	.14	4.7	0
45. *Roast, canned	60.0	217	25	13	0	9	164	2.2	(0)	.02	.24	4.5	0
46. Round steak (wholesale round)	67	194	19.3	13	0	11	208	2.9	(0)	.12	.15	5.2	0
47. Rump roast (wholesale rump)	53	341	15.5	31	0	9	167	2.3	(0)	.10	.12	4.2	0
48. Soup meat (wholesale shanks)	70	162	20.3	9	0	12	219	3.0	(0)	.13	.16	5.5	0
49. Stew meat (73 per cent lean)	53	333	15.8	30	0	9	170	2.4	(0)	.10	.12	4.3	0
Lamb:													
Carcass; side:													
50. Thin	66.3	202	17.1	14.8	0	10	184	2.6	(0)	.20	.25	5.6	0
51. Intermediate	55.8	312	15.7	27.7	0	9	169	2.4	(0)	.18	.23	5.2	0
52. Fat	46.2	410	13.0	39.8	0	8	140	2.0	(0)	.15	.19	4.3	0
Retail items,[7] intermediate grade													
53. Leg roast (wholesale leg)	63.7	230	18.0	17.5	0	10	194	2.7	(0)	.21	.26	5.9	0
54. Shoulder roast (wholesale 3-rib shoulder)	58.3	290	15.6	25.3	0	9	168	2.3	(0)	.18	.23	5.2	0
55. Sirloin chop (wholesale leg)	63.7	230	18.0	17.5	0	10	194	2.7	(0)	.21	.26	5.9	0
Pork:													
Packers' carcass; side:													
56. Thin	50	371	14.1	35	0	8	152	2.1	(0)	.89	.18	3.8	0
57. Medium	42	453	11.9	45	0	7	128	1.8	(0)	.75	.15	3.2	0
58. Fat	35	534	9.8	55	0	6	106	1.5	(0)	.62	.12	2.6	0
59. Miscellaneous lean cuts[8]	52	352	14.5	32.7	0	8	156	2.2	(0)	.92	.18	3.9	0
Retail items:[7]													
Bacon. See Fats, Oils.													
60. Boston butt	60	273	16.6	23	0	10	179	2.5	(0)	1.05	.21	4.5	0
61. Ham, fresh	53	340	15.2	31	0	9	164	2.3	(0)	.96	.19	4.1	0
62. Ham, smoked	42	384	16.9	35	(.3)	10	182	2.5	(0)	.78	.19	3.8	0
63. Loin	58	291	16.4	25	0	10	177	2.5	(0)	1.04	.20	4.4	0
64. Picnic	52	347	14.8	32	0	9	160	2.2	(0)	.94	.18	4.0	0
65. Pork links; sausage	41.9	446	10.8	44.8	0	6	116	1.6	(0)	.22	.15	2.3	0
Salt pork. See Fats, Oils.													
66. Spareribs	53	346	14.6	32	0	8	157	2.2	(0)	.92	.18	3.9	0

Note: Asterisk indicates Army ration component; parentheses, imputed value.

[6] Average values for composition of all cuts in a boned and trimmed carcass of commercial grade generally used for (a) chopped meat, (b) roasting and broiling, (c) stewing and boiling.

[7] Values for fresh items are from the medium fat wholesale cuts considered to be nearest approximations for corresponding retail items.

[8] Lean cuts from medium fat carcass weighted according to civilian supply, 1944 Excludes bacon, lard, salt side, fat back.

Nutritive Value of 100 Grams of Selected Foods, Edible Portion (*Continued*)

FOOD ITEM	WATER	FOOD ENERGY	PROTEIN	FAT	CARBO-HYDRATE	CALCIUM	PHOS-PHORUS	IRON	VITAMIN A VALUE	THIAMINE	RIBO-FLAVIN	NIACIN	ASCORBIC ACID
MEAT, POULTRY, FISH—*Continued*													
Veal:	*Per Cent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Inter-national Units*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*
Carcass; side, excluding kidney fat:													
67. Thin	71	151	19.7	8	0	11	212	3.0	(0)	0.18	0.28	6.5	0
68. Medium	68	184	19.1	12	0	11	206	2.9	(0)	.17	.27	6.3	0
69. Fat	65	218	18.5	16	0	11	199	2.8	(0)	.17	.26	6.1	0
Retail items,[7] medium fat:													
70. Chops (wholesale loin)	69	176	19.2	11	0	11	207	2.9	(0)	.18	.27	6.3	0
71. Cutlet (wholesale round)	70	159	19.5	9	0	11	210	2.9	(0)	.18	.28	6.4	0
72. Leg roast or steak (wholesale leg)	(68)	186	(19.1)	(12.2)	0	11	206	2.9	(0)	.17	.27	6.3	0
73. Stew meat (74 per cent lean)	64	226	18.3	17	0	11	197	2.7	(0)	.17	.26	6.0	0
Variety meats; meat mixtures:													
74. *Beef and gravy, canned[9]	65.3	188	19.4	11.7	1.3	19	122	2.7	(30)	.09	.19	2.7	0
75. Bologna	62.4	217	14.8	15.9	3.6	9	160	2.2	(0)	.31	.30	3.0	0
76. *Chile con carne, without beans, canned [10]	66.3	198	10.2	14.6	6.4	21	152	.7	160	.01	.10	2.1	0
77. Frankfurters	64.3	201	15.2	14.1	3.3	9	164	2.3	(0)	.19	.23	2.4	0
78. *Ham and eggs, canned[11]	63.9	227	14.4	18.3	1.2	43	166	2.2	500	.16	.24	1.7	0
79. *Hash, corned beef, canned[12]	69.4	143	15.1	6.1	7.0	26	(90)	1.3	(0)	.02	.13	2.4	0
80. *Hash, meat and vegetable, canned[13]	73.3	122	10.0	5.0	9.3	14	(66)	1.2	(0)	.04	.11	2.5	6
81. Heart, fresh	75.4	126	(16.5)	(6.3)	(.7)	10	236	6.2	(0)	.54	.90	6.8	14
82. Liver, fresh	70.9	131	(19.8)	(4.2)	(3.6)	8	373	12.1	19,200	.27	2.80	16.1	31
83. Liver sausage	59.0	258	16.7	20.6	1.5	9	238	5.4	(5,750)	.17	1.12	4.6	(0)
84. *Luncheon meat, canned[14]	56.3	270	15.2	22.5	1.7	21	170	1.4	(0)	.29	.21	2.7	0
85. *Pork and gravy, canned[15]	64.9	206	15.4	15.2	1.9	16	162	1.6	(0)	.19	.24	2.7	0
86. *Pork sausage, bulk, canned	57.0	280	16.0	24.0	0	17	131	2.2	(0)	.19	.21	2.8	0
87. *Spaghetti with meat, canned[16]	71.0	142	9.8	6.9	10.2	38	97	1.8	480	.02	.12	2.2	....
88. *Stew, meat and vegetable, canned[17]	72.9	127	11.6	5.5	7.8	36	(136)	1.4	1,780	.04	.12	2.4	4
89. Tongue, fresh, medium fat	68	202	16.4	15	.4	30	119	6.9	(0)	.22	.27	5.0	0
90. *Vienna sausage, canned	64.1	210	16.0	16.2	0	19	(164)	.6	(0)	.07	.14	3.1	0

Poultry:													
91. Chicken, boned, canned	67.1	175	21.8	9.8	0	32	(218)	(1.9)	Trace	.01	.15	3.7	2
92. Chicken, roasters[18]	66.0	194	20.2	12.6	0	16	218	1.9	Trace	.11	.18	8.6	....
93. Turkey, medium fat[18]	58.3	262	20.1	20.2	0	23	320	3.8	Trace	.12	.19	7.9	....
Fish and shellfish:													
94. Cod	82.6	70	16.5	.4	0	18	189	.9	....	.04	.05	2.3	2
95. Fish, miscellaneous, medium fat	77.2	98	19.0	2.5	0	21	218	1.0	....	.07	.07	4.2	(2)
96. Oysters, solids and liquor	87.1	50	6.0	1.2	3.7	68	172	7.1	....	.18	.23	1.2	....
97. Salmon, canned	67.4	169	20.6	9.6	0	67	286	1.3	[19] 80	.03	.18	6.5	0
98. Sardines, canned in oil, drained solids	57.4	207	25.7	11.0	1.2	35	365	1.8	290	.06	.12	5.2	0
99. Sardines, canned in oil, total contents of can	47.1	331	21.1	27	1.0	29	299	1.5	710	.05	.10	4.3	0
100. Shrimp, canned	78.3	82	17.8	.8	.8	(75)	(210)	(2.0)	60	.01	.03	1.9	0
101. Tuna fish, canned, drained solids	57.7	217	27.7	11.8	0	34	290	1.7	70	.04	.13	10.6	0
102. Tuna fish, canned, total contents of can	51.4	294	23.9	22.1	0	30	252	1.5	130	.04	.11	9.2	0
DRY BEANS AND PEAS, NUTS													
Dry beans and peas:													
103. *Bean soup, navy, dehydrated[20]	7.2	332	17.6	1.2	62.7	(148)	(463)	(10.3)	(0)	.46	.22	2.4	1
104. Beans, canned, baked	71.0	117	5.7	2.0	19.0	(49)	(154)	(3.4)	[21] 70	.05	.05	.8	[21] 4
105. Beans, common or kidney, dry seed	10.5	350	22.0	1.5	62.1	148	463	10.3	0	.60	.24	2.1	2
106. Beans, Lima, dry seed	12.6	341	20.7	1.3	61.6	68	381	7.5	0	.60	.24	2.1	2
107. Chickpeas	10.6	369	20.8	4.7	60.9	92	375	7.1	Trace	.35	.15	1.4	(2)
108. Cowpeas	10.6	351	22.9	1.4	61.6	80	450	7.8	0	.83	.23	2.2	2
109. *Pea soup, dehydrated[22]	7.2	336	20.4	1.2	60.8	(73)	(397)	(6.0)	220	.62	.21	3.1	2
110. Peas, split	10.0	354	24.5	1.0	61.7	73	397	6.0	370	.29	.29	3.0	2
111. Soybeans, whole, mature	7.5	351	34.9	18.1	[23](12.0)	227	586	8.0	110	1.14	.31	2.1	Trace
Soy flour; flakes; grits:													
112. Low fat	11	246	44.7	1.1	[23](14.2)	265	623	13.0	70	1.10	.35	2.9	(0)
113. Medium fat	9	283	42.5	6.5	[23](13.6)	244	610	13.0	110	.82	.34	2.6	(0)
114. Full fat	9	375	35.9	20.6	[23](11.4)	195	553	12.1	140	.77	.28	2.2	(0)

Note: Asterisk indicates Army ration component; parentheses, imputed value.

[7] Values for fresh items are from the medium fat wholesale cuts considered to be nearest approximations for corresponding retail items.

[9] 90 per cent beef, 10 per cent tomato gravy.

[10] Not less than 60 per cent meat, not more than 8 per cent cereals, seasonings.

[11] 50 per cent ham, 50 per cent whole eggs.

[12] 72 per cent beef, 28 per cent potatoes.

[13] 50 per cent meat, 48 per cent potatoes, 2 per cent onions.

[14] Pork.

[15] 90 per cent pork, 10 per cent gravy.

[16] 50 per cent meat, 10 per cent dry spaghetti, 30 per cent tomato purée, 5 per cent cheese, 5 per cent onions.

[17] 50 per cent meat, 15 per cent potatoes 15 per cent carrots, 8 per cent dry beans, 12 per cent tomato purée.

[18] Vitamin values based on muscle meat only.

[19] Based on pink salmon. Canned red salmon may have a value several times higher.

[20] Navy bean meal, farinaceous flour up to 15 per cent.

[21] Contributed by tomatoes.

[22] Pea meal, farinaceous flour up to 15 per cent.

[23] "Available" carbohydrate.

NUTRITIVE VALUE OF 100 GRAMS OF SELECTED FOODS, EDIBLE PORTION (*Continued*)

FOOD ITEM	WATER	FOOD ENERGY	PROTEIN	FAT	CARBOHYDRATE	CALCIUM	PHOSPHORUS	IRON	VITAMIN A VALUE	THIAMINE	RIBOFLAVIN	NIACIN	ASCORBIC ACID
DRY BEANS AND PEAS, NUTS—*Continued*													
Nuts:	*Per Cen*	*Calories*	*Grams*	*Grams*	*Grams*	*Milligrams*	*Milligrams*	*Milligrams*	*International Units*	*Milligrams*	*Milligrams*	*Milligrams*	*Milligrams*
115. Almonds	4.7	640	18.6	54.1	19.6	254	475	4.4	0	0.25	0.67	4.6	Trace
116. Peanut butter	1.7	619	26.1	47.8	21.0	74	393	1.9	0	.20	.16	16.2	(0)
117. Peanuts, roasted	2.6	600	26.9	44.2	23.6	74	393	1.9	0	[24] .30	.16	16.2	(0)
118. Pecans	3.0	747	9.4	73.0	13.0	74	324	2.4	50	.72	.11	.9	2
119. Walnuts, English	3.3	702	15.0	64.4	15.6	83	380	2.1	30	.48	.13	1.2	3
VEGETABLES													
Fresh:													
120. Asparagus	93.0	26	2.2	.2	3.9	21	62	.9	1,000	.16	.17	1.2	33
121. Beans, Lima, green	66.5	131	7.5	.8	23.5	63	158	2.3	280	.25	.14	.9	32
122. Beans, snap	88.9	42	2.4	.2	7.7	65	44	1.1	630	.08	.10	.6	19
123. Beet greens	90.4	33	2.0	.3	5.6	[25]	45	3.2	6,700	.05	.17	.3	34
124. Beets	87.6	46	1.6	.1	9.6	27	43	1.0	20	.03	.05	.4	10
125. Broccoli	89.9	37	3.3	.2	5.5	130	76	1.3	3,500	.09	.21	.9	118
126. Brussels sprouts	84.9	58	4.4	.5	8.9	34	78	1.3	400	.11	(.06)	(.3)	94
127. Cabbage	92.4	29	1.4	.2	5.3	46	31	.5	80	.07	.06	.3	52
128. Carrots	88.2	45	1.2	.3	9.3	39	37	.8	12,000	.07	.06	.5	6
129. Cauliflower	91.7	31	2.4	.2	4.9	22	72	1.1	90	.10	.11	.6	69
130. Celery	93.7	22	1.3	.2	3.7	[26] 50	40	.5	0	.03	.04	.3	7
131. Chard	91.8	25	1.4	.2	4.4		36	4.0	2,800	.06	.13	.2	38
132. Collards	86.6	50	3.9	.6	7.2	249	58	1.6	6,870	.22	(.20)	(.8)	100
133. Corn, sweet, white or yellow	73.9	108	3.7	1.2	20.5	9	120	.5	[27] 390	.15	.14	1.4	12
134. Cucumbers	96.1	14	.7	.1	2.7	10	21	.3	[28] 0	.04	.09	.2	8
135. Dandelion greens	85.8	52	2.7	.7	8.8	187	70	3.1	13,650	.19	.14	(.8)	36
136. Eggplant	92.7	28	1.1	.2	5.5	15	37	.4	30	.07	.06	.8	5
137. Kale	86.6	50	3.9	.6	7.2	225	62	2.2	7,540	.12	.35	(.8)	115
138. Lettuce, headed	94.8	18	1.2	.2	2.9	22	25	.5	540	.06	.07	.2	8

139. Lettuce, all other	94.8	18	1.2	.2	2.9	62	20	1.1	1,620	.06	.07	.2	18
140. Mustard greens	92.2	28	2.3	.3	4.0	220	38	2.9	6,460	.09	.20	.8	102
141. Okra	89.8	39	1.8	.2	7.4	82	62	.7	740	.12	.10	.7	30
142. Onions, mature	87.5	49	1.4	.2	10.3	32	44	.5	50	.03	.02	.1	[29] 9
143. Parsnips	78.6	83	1.5	.5	18.2	57	80	.7	0	.11	.09	.2	18
144. Peas, green	74.3	101	6.7	.4	17.7	22	122	1.9	680	.36	.18	2.1	26
145. Peppers, green	92.4	29	1.2	.2	5.7	11	25	.4	630	.07	.04	.4	120
146. Potatoes	77.8	85	2.0	.1	19.1	11	56	.7	20	.11	.04	1.2	17
147. Pumpkin	90.5	36	1.2	.2	7.3	21	44	.8	(3,400)	(.05)	(.08)	(.6)	8
148. Radishes	93.6	22	1.2	.1	4.2	37	31	1.0	30	.04	.04	.1	24
149. Rutabagas	89.1	41	1.1	.1	8.9	55	41	.4	330	.06	.06	.5	36
150. Spinach	92.7	25	2.3	.3	3.2	[30]	55	3.0	9,420	.12	.24	.7	59
151. Squash, summer	95.0	19	.6	.1	3.9	15	15	.4	260	.04	.05	1.1	17
152. Squash, winter	88.6	44	1.5	.3	8.8	19	28	.6	4,950	.05	.08	.6	8
153. Sweet potatoes	68.5	125	1.8	.7	27.9	30	49	.7	[31] 7,700	.10	.06	.7	22
154. Tomatoes	94.1	23	1.0	.3	4.0	11	27	.6	1,100	.06	.04	.6	23
155. Turnip greens	89.5	37	2.9	.4	5.4	259	50	2.4	9,540	.10	.56	.8	136
156. Turnips	90.9	35	1.1	.2	7.1	40	34	.5	Trace	.06	.06	.5	28
Canned:													
157. Asparagus	93.6	21	1.6	.3	3.0	20	34	1.0	[32] 600	.06	.09	.8	15
158. Beans, Lima	80.9	72	3.8	.3	13.5	27	73	1.7	130	.03	.05	.5	8
159. Beans, snap	94.0	19	1.0	0	3.8	27	19	1.4	410	.03	.05	.3	4
160. Beets	89.4	39	1.0	0	8.7	15	29	.6	20	.01	.03	.1	5
161. Carrots	92.2	30	.5	.4	6.1	22	24	.6	12,000	.03	.02	.3	2
162. Corn, white or yellow	80.5	77	2.0	.5	16.1	4	51	.5	[27] 200	.02	.05	.8	5
163. Peas, green	82.3	69	3.4	.4	12.9	25	67	1.8	540	.11	.06	.9	8
164. Pumpkin	90.2	38	1.0	.3	7.9	(20)	(36)	(.7)	3,400	.02	.06	.5	(0)
165. Sauerkraut	93.2	20	1.1	.2	3.4	(46)	(31)	(.5)	Trace	.03	.20	.2	[33] 18
166. Spinach	92.3	25	2.3	.4	3.0	[34]	33	1.6	6,790	.02	.08	.3	14

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[24] Based on peanuts without skins; when skins are included the thiamine value is higher.
[25] 118 mg.; may not be available because of presence of oxalic acid.
[26] 105 mg.; may not be available because of presence of oxalic acid.
[27] Based on yellow corn; white corn contains only a trace.
[28] Based on pared cucumber; unpared contains about 260 I. U. vitamin A per 100 Gm.
[29] Green bunching onions contain about 23 mg. ascorbic acid per 100 Gm.
[30] 81 mg.; may not be available because of presence of oxalic acid.
[31] If pale varieties only were used, value would be very much lower.
[32] Based on green products; bleached products contain only a trace.
[33] Drained solids only.
[34] 90 mg.; may not be available because of presence of oxalic acid.

Nutritive Value of 100 Grams of Selected Foods, Edible Portion (*Continued*)

FOOD ITEM	WATER	FOOD ENERGY	PROTEIN	FAT	CARBO-HYDRATE	CALCIUM	PHOS-PHORUS	IRON	VITAMIN A VALUE	THIAMINE	RIBO-FLAVIN	NIACIN	ASCORBIC ACID
VEGETABLES—*Continued*													
Canned—Continued	*Per Cent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Inter-national Units*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*
167. Tomato catsup	69.5	110	2.0	0.4	24.5	12	18	.08	(1,880)	0.09	0.07	2.2	11
168. Tomato juice	93.5	23	1.0	.2	4.3	(7)	(15)	(.4)	1,050	.05	.03	.7	16
169. Tomato purée	89.2	40	1.8	.5	7.2	(11)	(37)	(1.1)	1,880	.09	(.07)	1.8	28
170. Tomatoes	94.2	21	1.0	.2	3.9	(11)	(27)	(.6)	1,050	.05	.03	.7	16
Dehydrated:[35]													
171. *Cabbage, unsulfited[36]	8.8	346	13.7	1.8	68.8	374	274	4.7	520	.41	.37	2.4	189
172. *Carrots	5.6	361	4.0	1.4	83.1	(242)	(102)	(5.9)	117,000	.29	.28	3.2	11
173. *Onions	9.9	350	10.1	1.0	75.2	158	256	3.1	20	.23	.15	1.1	37
174. *Potatoes	7.2	363	7.1	.7	82.0	25	103	3.7	(0)	.25	.10	4.8	26
175. *Sweet potatoes	5.3	373	5.1	.9	86.1	(76)	(75)	(2.3)	21,900	.18	.14	1.9	34
FRUIT													
Fresh:													
176. Apples	84.1	64	.3	.4	14.9	6	10	.3	90	.04	.02	.2	5
177. Apricots	85.4	56	1.0	.1	12.9	16	23	.5	2,790	.03	.04	.7	4
178. Avocados	65.4	265	1.7	26.4	5.1	10	38	.6	290	.12	.15	11.	16
179. Bananas	74.8	99	1.2	.2	23	8	28	.6	430	.09	.06	.6	10
Berries:													
180. Blueberries	83.4	68	.6	.6	15.1	16	13	.8	280	(.03)	(.07)	(.3)	16
181. Strawberries	90.0	41	.8	.6	8.1	28	27	.8	60	.03	.07	.3	60
182. Other berries	84.4	65	1.2	.8	13.2	36	34	.9	320	.03	(.07)	(.3)	23
183. Cantaloupe	94.0	23	.6	.2	4.6	17	16	.4	[37]3,420	.06	.04	.8	33
184. Grapefruit	88.8	44	.5	.2	10.1	17	18	.3	Trace	.04	.02	.2	40
185. Grapes	81.6	74	.8	.4	16.7	17	21	.6	80	.05	.03	.4	4
186. Lemons	89.3	44	.9	.6	8.7	(14)	(10)	(.1)	0	.04	Trace	.1	45
187. Limes	86.0	53	.8	.1	12.3	(14)	(10)	(.1)	0	(.04)	(Trace)	(.1)	27
188. Oranges	87.2	50	.9	.2	11.2	33	23	.4	(190)	.08	.03	.2	49
189. Peaches	86.9	51	.5	.1	12.0	8	22	.6	880	.02	.05	.9	8

190. Pears	82.7	70	.7	.4	15.8	13	16	.3	20	.02	.04	.1	4
191. Pineapples	85.3	58	.4	.2	13.7	16	11	.3	130	.08	(.02)	(.2)	24
192. Plums	85.7	56	.7	.2	12.9	17	20	.5	350	.15	(.03)	.6	5
193. Rhubarb	94.9	18	.5	.1	3.8	[38]	25	.5	30	.01	....	.1	9
194. Tangerines; other mandarin type oranges	87.3	50	.8	.3	10.9	(33)	(23)	(.4)	(420)	.07	(.03)	(.2)	31
195. Watermelons	92.1	31	.5	.2	6.9	7	12	.2	590	.05	.05	.2	6
Canned:													
196. Apples; applesauce	79.8	80	.2	.1	19.7	(4)	(6)	(.2)	(60)	.01	.01	Trace	1
197. Apricots	77.3	89	.6	.1	21.4	(10)	(15)	(.3)	1,350	.02	.02	.3	4
198. Cherries	78.1	86	.6	.1	20.8	(11)	(14)	(.3)	(430)	.03	.02	.2	3
199. Cranberry sauce	48.1	209	.1	.3	51.4	(8)	(7)	(.3)	(30)	....	(.04)	....	2
200. Fruit cocktail	(80.6)	78	(.4)	(.2)	(18.6)	(9)	(12)	(.4)	160	.01	.01	.4	2
201. Grapefruit juice	89.4	41	.5	.2	9.4	8	12	.4	Trace	.03	.02	.2	35
202. Grapefruit segments	79.8	81	.6	.2	19.1	13	14	.3	Trace	.03	.02	.2	30
203. Orange juice	86	55	.6	.1	12.9	(33)	(23)	(.4)	(100)	.07	.02	.2	42
204. Peaches	80.9	75	.4	.1	18.2	(5)	(14)	(.4)	450	.01	.02	.7	4
205. Pears	81.1	75	.2	.1	18.4	(8)	(10)	(.2)	Trace	.01	.02	.1	2
206. Pineapple juice	86.2	54	.3	.1	13.0	15	8	.5	80	.05	.02	.2	9
207. Pineapples	78.0	87	.4	.1	21.1	29	7	.6	80	.07	.02	.2	9
208. Plums; Italian prunes	78.6	84	.4	.1	20.4	8	12	1.1	(230)	.03	.03	.4	1
Dried:													
209. *Apple nuggets	1.6	390	1.4	1.0	93.9	24	42	4.1	(0)	.05	.08	.5	11
210. Apricots[39]	24	292	5.2	.4	66.9	86	119	4.9	7,430	.01	.16	3.3	12
211. *Cranberries	4.9	409	2.9	6.6	84.4	82	22	3.4	660	.19	.18	.9	33
212. Peaches[39]	24	295	3.0	.6	69.4	44	126	6.9	3,250	.01	.20	5.4	19
213. Prunes[40]	24	299	2.3	.6	71.0	54	85	3.9	1,890	.10	.16	1.7	3
214. Raisins[40]	24	298	2.3	.5	71.2	78	129	3.3	50	.15	.08	.5	Trace
Synthetic fruit powders, canned:													
215. *Grape juice[41]	.2	[42] 250	.1	.5	3.1	132	65	.1	(0)	0	(0)	(0)	600
216. *Lemon juice[43]	1.7	[42] 336	.4	.3	60.8	60	33	1.5	(0)	(0)	(0)	(0)	876
217. Orange juice[44]	1.9	[42] 341	1.1	.2	65.1	180	101	2.2	(0)	(0)	(0)	(0)	927

Note: Asterisk indicates Army ration component; parentheses, imputed value.

[35] Freshly dehydrated products; some loss of vitamins is to be expected during storage.

[36] If sulfited, the thiamine value would be much lower and the ascorbic acid value would be about double.

[37] Based on deeply colored varieties.

[38] 51 mg.; may not be available because of presence of oxalic acid.

[39] Sulfured.

[40] Unsulfured.

[41] Citric acid, dextrose, coloring flavoring, ascorbic acid.

[42] Caloric value of organic acids included.

[43] Powdered lemon juice and corn sirup, dextrose, citric acid, oil of emon, ascorbic acid.

[44] Powdered orange juice, lemon juice, and corn sirup, dextrose, citric acid, oil of orange, ascorbic acid.

NUTRITIVE VALUE OF 100 GRAMS OF SELECTED FOODS, EDIBLE PORTION (*Continued*)

FOOD ITEM	WATER	FOOD ENERGY	PROTEIN	FAT	CARBOHYDRATE	CALCIUM	PHOSPHORUS	IRON	VITAMIN A VALUE	THIAMINE	RIBOFLAVIN	NIACIN	ASCORBIC ACID
GRAIN PRODUCTS													
Flour, meal:													
Corn meal:	*Per Cent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milligrams*	*Milligrams*	*Milligrams*	*International Units*	*Milligrams*	*Milligrams*	*Milligrams*	*Milligrams*
218. White, degerminated	12	355	7.5	1.1	78.8	10	140	1.0	(0)	0.16	0.09	0.9	0
219. White, whole-grain	12	365	9.1	3.7	73.9	18	248	2.7	(0)	.41	.12	1.7	0
220. Yellow, degerminated	12	356	8.3	1.2	78.0	10	140	1.0	300	.15	.06	.9	0
221. Yellow, whole-grain	12	365	9.1	3.7	73.9	18	276	2.7	510	.45	.17	2.1	0
222. Cornstarch	12	352	.5	.2	87.0	Trace	Trace	Trace	(0)	(0)	(0)	(0)	0
Flour:													
223. Buckwheat, light	12	354	6.3	1.1	79.7	11	88	1.0	(0)	[45] .31	[45] .08	[45] 2.1	0
224. Rye, light	11	358	8.9	.9	78.5	18	278	1.3	(0)	.15	.07	.9	0
225. Rye, whole-grain	10	461	11.2	1.7	75.2	61	369	4.8	(0)	.47	.21	1.7	0
Soy. See Dry Beans and Peas.													
226. Wheat, patent	12	355	10.8	.9	75.9	19	93	.7	(0)	.07	.03	.8	0
227. Wheat, patent, enriched	12	355	10.8	.9	75.9	19	93	(2.9)	(0)	(.44)	(.26)	(3.5)	0
228. Wheat, self-rising	12	340	10.2	.9	72.9	220	330	.6	(0)	.02	.02	.7	0
229. Wheat, self-rising, enriched	12	340	10.2	.9	72.9	220	330	(2.9)	(0)	(.44)	(.26)	(3.5)	0
230. Whole wheat	11	360	13.0	2.0	72.4	38	385	3.8	(0)	.56	.12	5.6	0
Baked goods:													
Bread:													
231. Rye, light	37.6	263	(6.4)	(3.4)	(51.7)	(22)	(96)	(.8)	(0)	.16	(.04)	(1.1)	0
232. White, enriched	35.9	261	8.5	2.0	52.3	(56)	(100)	(1.8)	(0)	(.24)	(.15)	(2.2)	0
233. Whole wheat	37	262	9.5	3.5	48.0	(60)	370	2.6	(0)	.28	.15	3.5	0
234. Cake, light batter type	26.8	327	6.4	8.2	57.0	62	(126)	2.0	....	.03	.10	.7	0
235. Cookies, assorted, plain	4.8	438	6.0	12.7	75.0	(22)	(65)	(.6)	(0)	(.04)	(.04)	(.5)	0
236. Cracker meal; crackers, assorted	4.5	422	9.5	10.3	72.7	22	102	1.5	(0)	(.07)	(0)	(.6)	0
237. Crackers, graham	5.5	419	8.0	10.0	74.3	20	203	1.9	(0)	.30	.12	1.5	0
238. Fig bars	13.8	363	4.2	4.8	75.8	(69)	(69)	(1.3)	(0)	(.02)	(.06)	(.9)	0
239. Pie, apple	....	266	(2.9)	(9.6)	(42.0)	(11)	(22)	1.9	(0)	(.05)	(.04)	.4	(0)
240. Pie, cream	....	223	(2.8)	(9.8)	(31.0)	20	(38)	.5	(0)	.03	.08	.2	(0)
241. Rolls, plain, enriched	29.4	304	8.2	6.1	54.1	(56)	(100)	(1.8)	(0)	(.24)	(.15)	(2.2)	0
242. Rolls, sweet, unenriched	29.6	304	7.8	5.4	56.0	(56)	(100)	.5	(0)	.08	.13	.8	0

	Breakfast cereals:													
243.	Corn flakes	9.3	359	7.9	.7	80.3	(10)	56	(1.0)	(0)	(.16)	.08	1.6	0
	Corn flakes, restored. See page 4.													
244.	Oatmeal	8.3	396	14.2	7.4	68.2	54	365	5.2	(0)	.55	.14	1.1	0
245.	Rice flakes; puffed rice	8.8	363	7.2	.4	82.6	(9)	(92)	.9	(0)	(.05)	(.03)	(1.4)	0
	Rice flakes; puffed rice, restored. See page 4.													
	Wheat cereals:													
246.	Farina	11	359	11.5	1.0	76.1	21	125	.8	(0)	.06	.06	1.0	0
247.	Farina, enriched	11	359	11.5	1.0	76.1	21	125	(1.3)	(0)	(.37)	(.26)	(1.3)	0
248.	Flakes; puffed wheat	6.2	372	11.9	1.5	77.7	33	353	3.7	(0)	.15	.12	4.2	0
	Flakes; puffed wheat, restored. See page 4.													
249.	Shredded wheat	7.7	369	10.4	1.4	78.7	(38)	(385)	(3.8)	(0)	.20	.14	4.2	0
250.	Whole-grain, uncooked	8.7	368	11.7	2.0	75.8	38	385	3.8	(0)	.45	.13	4.6	0
	Other cereals:													
251.	Barley, pearled, light	11.1	357	8.2	1.0	78.8	16	189	(2.0)	(0)	.12	.08	3.1	0
252.	Hominy	11.4	357	8.5	.8	78.9	11	70	1.0	(0)	.15	.05	(.9)	0
253.	Macaroni; spaghetti	11	360	13	1.4	73.9	22	144	1.2	(0)	.13	.08	2.1	0
254.	Noodles	9.1	385	14.3	5.0	70.6	24	156	1.9	(200)	(.13)	(.12)	(2.1)	0
	Rice:													
255.	Brown	12.0	356	7.5	1.7	77.7	39	303	5.5	(0)	.29	.05	4.6	0
256.	Converted	(12.3)	351	(7.6)	(.3)	(79.4)	(9)	(92)	(.7)	(0)	.23	.04	3.8	0
257.	White	12.3	351	7.6	.3	79.4	9	92	.7	(0)	.05	.03	1.4	0
258.	Tapioca	12.6	350	.6	.2	86.4	12	12	(1.0)	(0)	0	(0)	(0)	0
	SUGARS, SWEETS													
259.	Honey	20	319	.3	0	79.5	5	16	.9	(0)	Trace	.04	.2	4
260.	Jams; marmalades	28	288	.5	.3	70.8	12	12	(.3)	10	.02	.02	.2	6
261.	Jellies	34.5	261	.2	0	65.0	(12)	(12)	(.3)	(10)	(.02)	(.02)	(.2)	4
262.	Molasses, cane	24	240	(0)	(0)	(60)	273	51	6.7	(0)	.08	.16	2.8	(0)
263.	Sirup, table blends	25	296	(0)	(0)	(74)	46	16	4.1	0	0	.01	.1	(0)
264.	Sugar, brown	3	382	(0)	(0)	95.5	76	[46]37	(0)	(0)	(0)	(0)	(0)	(0)
265.	Sugar, granulated or powdered	.5	398	(0)	(0)	99.5	(0)	(0)	.1	(0)	(0)	(0)	(0)	0

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[45] Whole-grain buckwheat flour has approximately 0.61 mg. thiamine; 0.16 mg. riboflavin; and 4.2 mg. niacin per 100 Gm.

[46] Based on dark brown sugar; lower values for light brown sugar.

NUTRITIVE VALUE OF 100 GRAMS OF SELECTED FOODS, EDIBLE PORTION (*Continued*)

FOOD ITEM	WATER	FOOD ENERGY	PROTEIN	FAT	CARBO-HYDRATE	CALCIUM	PHOS-PHORUS	IRON	VITAMIN A VALUE	THIAMINE	RIBO-FLAVIN	NIACIN	ASCORBIC ACID
MISCELLANEOUS	*Per Cent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Inter-national Units*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*
266. *Bouillon cubes	(3)	259	17.7	0	47.0	40	510	9.2	(0)	0.03	0.83	[47].6	(0)
267. Chocolate, unsweetened	2.3	570	(5.5)	52.9	(18)	[48]	343	2.5	(0)	Trace	.24	1.1	(0)
268. Cocoa	4.3	329	(9.0)	18.8	(31.0)	[49]	709	2.7	(0)	Trace	(.39)	(2.3)	(0)
269. Coconut, dry, shredded	3.3	579	3.6	39.1	53.2	43	191	3.6	0	Trace	Trace	Trace	(0)
270. Gelatin dessert powder	1.6	392	9.4	0	88.7	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
271. Olives, green	75.2	144	1.5	13.5	4.0	101	15	2.0	420	Trace	....	....	....
272. Pickles, cucumber	95.2	11	.5	.2	1.9	24	22	.9	190	.01	.02	Trace	7
273. Wheat germ	11.0	389	25.2	10.0	49.5	84	1,096	8.1	(0)	2.05	.80	4.6	(0)
274. Yeast, compressed, baker's	70.9	109	13.3	.4	13.0	25	605	4.9	(0)	.45	2.07	28.2	(0)
275. Yeast, dried, Brewer's	7.0	348	46.1	1.6	37.4	106	1,893	18.2	(0)	9.69	5.45	36.2	(0)

Note: Asterisk indicates Army ration component; parentheses, imputed value.

[47] Based on vegetable extract type; meat extract type may have up to 27.0 mg. of niacin per 100 Gm.

[48] 95 mg.; may not be available because of presence of oxalic acid.

[49] 160 mg.; may not be available because of presence of oxalic acid.

AVERAGE COMPOSITION OF THE MOST COMMONLY USED FOOD MATERIALS

100-GM. PORTIONS

Food	*Carbohydrate Gm.*	*Protein Gm.*	*Fat Gm.*
CEREALS AND BREADSTUFFS			
Breakfast cereal, dry	80	10	5
Breakfast cereal, cooked	11	1	1
Rice, cooked	21	1	
White bread	53	9	2
Whole-wheat bread	49	10	1
Rye bread	53	9	1
Ry-Krisp	70	12	2
Soda crackers	73	10	9
Saltine	69	11	13
Graham cracker	73	10	9
Zwieback	74	10	10
Soybean muffin (one)	1	3	9
Macaroni, cooked	16	3	2
Spaghetti, cooked	17	3	
Noodles, cooked	17	3	
Tapioca, cooked	14		
FATS			
Butter			85
Oleomargarine			83
Olive oil and other oils			100
Salad dressings made with oil (p. 717)			85
Lard, tallow, bacon fat			85–100
DAIRY PRODUCTS			
Whole milk	5	3	4
Skimmed milk	5	3	1
Buttermilk	5	3	1
Cream, 20% fat	5	3	20
Cream, 30% fat	4	3	30
Cream, 40% fat	3	2	40
Cottage cheese	4	21	1
Cheese		29	36
Egg (each)		6	6
Egg yolk (one)		3	6
Egg white (one)		3	

Food	*Carbohydrate Gm.*	*Protein Gm.*	*Fat Gm.*
Meats and Meatstuffs			
Lean meat, cooked		25	15
Fat meat, cooked		25	30
Bacon, cooked		25	50
Liver	2	20	4
Sweetbreads		20	16
Dried beef		30	6
Fish: halibut, lake trout, perch, whitefish		18	5
Salmon, fresh or canned		22	13
Oyster	4	6	1
Shrimp		25	1
Crabmeat		16	2
Lobster		18	1
Sardine		23	20
Vegetables and Fruits			
3% vegetables	3	1	
6% vegetables	6	1	
15% vegetables	15	1	
20% vegetables:			
Potato	20	2	
Green corn	20	3	
Shelled bean	20	7	
5% fruit	5	1	
10% fruit	10	1	
15% fruit	15	1	
20% fruit	20	2	
Green olives	2	1	10
Ripe olives	4	1	20
Nuts			
Almond*	3	21	55
Butternut	3	28	61
Peanut†	6	30	50
Peanut butter	6	29	46
Brazil nut	7	17	67
Hickory nut	11	15	67
Black walnut	12	28	56
Pecan	13	11	71
Filbert	13	16	65
Beechnut	13	22	57
English walnut	16	17	63
Chestnut	42	6	5

* Almonds have an average of 17 COH. per 100 Gm., but only 3 Gm. are available.

† Peanuts have an average of 24 COH. per 100 Gm., but only 6 Gm. are available.

Classification of Fresh Vegetables and Fresh Fruits According to Percentage of Carbohydrate Content

VEGETABLES

3%	6%	15%	20%
Asparagus	Artichokes—French	Parsnip	Corn
Beet greens	Beet	Salsify	Garlic
Broccoli	Carrot	Pea	Horse-radish root
Brussels sprouts	Celeriac		Potato
Cabbage	Dandelion greens		Shelled bean
Chinese cabbage	Kale		
Cauliflower	Kohlrabi		
Celery	Leeks		
Cucumber	Onion		
Eggplant	Parsley		
Endive	Pea (tiny)		
Lettuce	Pumpkin		
Marrow	Rutabaga		
Mustard greens	String bean (mature)		
Green pepper	Squash		
Okra	Turnip		
Radish			
Sauerkraut			
Sorrel			
Spinach			
String bean (tiny)			
Summer squash			
Tomato			
Water cress			

FRUITS

5%	10%	15%	20%
Muskmelon	Blackberry	Apple	Banana
Honeydew	Cranberry	Apricot	Fig (fresh)
Watermelon	Gooseberry	Blueberry	Grape juice
Rhubarb	Grapefruit	Cherry	Fresh prune
Avocado*	Lemon	Currant	
	Lime	Grape	
	Orange	Guava	
	Papaya	Huckleberry	
	Peach	Nectarine	
	Pineapple	Papaw	
	Strawberry	Pear	
	Tangerine	Plum	
		Quince	
		Raspberry	

* Avocados contain 17.2% fat.

Mushrooms have no assimilable carbohydrate, fat or protein.

RECOMMENDED DIETARY ALLOWANCES, REVISED 1945[1]

(AMOUNTS PER DAY)

Food and Nutrition Board, National Research Council

	Calories	Protein grams	Calcium grams	Iron mg.	Vitamin A I. U.[2]	Thiamine mg.[3]	Riboflavin mg.[3]	Niacin (Nicotinic acid) mg.[3]	Ascorbic acid mg.	Vitamin D I. U.
Man (154 lbs., 70 Kg.)										
Sedentary	2,500	70	0.8	12[4]	5,000	1.2	1.6	12	75	[5]
Moderately active	3,000	70	0.8	12[4]	5,000	1.5	2.0	15	75	[5]
Very active	4,500	70	0.8	12[4]	5,000	2.0	2.6	20	75	[5]
Woman (123 lbs., 56 Kg.)										
Sedentary	2,100	60	0.8	12	5,000	1.1	1.5	11	70	[5]
Moderately active	2,500	60	0.8	12	5,000	1.2	1.6	12	70	[5]
Very active	3,000	60	0.8	12	5,000	1.5	2.0	15	70	[5]
Pregnancy (latter half)	2,500[6]	85	1.5	15	6,000	1.8	2.5	18	100	400 to 800
Lactation	3,000	100	2.0	15	8,000	2.0	3.0	20	150	400 to 800
Children up to 12 yrs.[7]:										
Under 1 yr.[8]	100/2.2 lbs. (1 Kg.)	3.5/2.2 lbs. (1 Kg.)	1.0	6	1,500	0.4	0.6	4	30	400 to 800
1–3 yrs. (29 lbs., 13 Kg.)	1,200	40	1.0	7	2,000	0.6	0.9	6	35	400
4–6 yrs. (42 lbs., 19 Kg.)	1,600	50	1.0	8	2,500	0.8	1.2	8	50	400
7–9 yrs. (55 lbs., 25 Kg.)	2,000	60	1.0	10	3,500	1.0	1.5	10	60	400
10–12 yrs. (75 lbs., 34 Kg.)	2,500	70	1.2	12	4,500	1.2	1.8	12	75	400
Children over 12 yrs.[7]:										
Girls, 13–15 yrs. (108 lbs., 49 Kg.)	2,600	80	1.3	15	5,000	1.3	2.0	13	80	400
16–20 yrs. (119 lbs., 54 Kg.)	2,400	75	1.0	15	5,000	1.2	1.8	12	80	400
Boys, 13–15 yrs. (103 lbs., 47 Kg.)	3,200	85	1.4	15	5,000	1.5	2.0	15	90	400
16–20 yrs. (141 lbs., 64 Kg.)	3,800	100	1.4	15	6,000	1.8	2.5	18	100	400

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[1] Tentative goal toward which to aim in planning practical dietaries; can be met by a good diet with a variety of natural foods. Such a diet will also provide other minerals and vitamins, the requirements for which are less well known.

[2] The allowance depends on the relative amounts of vitamin A and carotene. The allowances of the table are based on the premise that approximately two-thirds of the vitamin A value of the average diet in this country is contributed by carotene and that carotene has half or less than half the value of vitamin A.

[3] For adults (except pregnant and lactating women) receiving diets supplying 2,000 calories or less, such as reducing diets, the allowances of thiamine, riboflavin and niacin may be 1 mg., 1.5 mg. and 10 mg., respectively. The fact that figures are given for different calorie levels for thiamine, riboflavin and niacin does not imply that we can estimate the requirement of these factors within 500 calories, but they are added merely for simplicity of calculation. Other members of the B complex also are required, though no values can be given. Foods supplying adequate thiamine, riboflavin and niacin will tend to supply sufficient of the remaining B vitamins.

[4] There is evidence that the male adult needs little or no iron. The allowance will be provided if the diet is satisfactory in other respects.

[5] For persons who have no opportunity for exposure to clear sunshine and for elderly persons, the ingestion of small amounts of vitamin D may be desirable. Other adults probably have little need for vitamin D.

[6] During the latter part of pregnancy the allowance should increase approximately 20 per cent over the preceding level. The value of 2,500 calories represents the allowance for pregnant, sedentary women.

[7] Allowances for children are based on the needs for the middle year in each group (as 2, 5, 8, etc.) and are for moderate activity and for average weight at the middle year of the age group.

[8] Needs of infants increase from month to month with size and activity. The amounts given are for approximately 6 to 8 months. The dietary requirements for some of the nutrients such as protein and calcium are less if derived largely from human milk.

Further recommendations:

Fat. There is available little information concerning the human requirement for fat. Fat allowances must be based at present more on food habits than on physiologic requirements. While a requirement for certain unsaturated fatty acids (the linoleic and arachidonic acids of natural fats) has been amply demonstrated with experimental animals, the human need for these fatty acids is not known. In spite of the paucity of information on this subject, there are several factors which make it desirable that fat be included in the diet to the extent of at least 20 to 25 per cent of the total calories and that the fat intake include "essential" unsaturated fatty acids to the extent of at least 1 per cent of the total calories. At higher levels of caloric expenditure, e.g., for a very active person consuming 4,500 calories and for children and adolescent persons, it is desirable that 30 to 35 per cent of the total calories be derived from fat. Since foodstuffs such as meat, milk, cheese and nuts may be expected to contribute "invisible" fat to the extent of from one half to two thirds of the total amounts of fat implied by the above proportions of the total calories, it is satisfactory to use separated or "visible" fats such as butter, margarine, lard and shortenings only to the extent of one third to one half of the amounts indicated.

Copper. The requirement for copper for adults is about 1 to 2 mg. daily. Infants and children require approximately 0.05 mg. for each kilogram of body weight. The requirement for copper is approximately one tenth that for iron. A good diet normally will supply sufficient copper.

Iodine. The requirement for iodine is small, probably about 0.002 to 0.004 mg. daily for each kilogram of body weight, or a total of 0.15 to 0.30 mg. daily for the adult. This need is met by the regular use of iodized salt; its use is especially important in *adolescence* and *pregnancy*.

Phosphorus. Available evidence indicates that the phosphorus allowances should be at least equal to those for calcium in the diets of children and o women during the latter part of pregnancy and during lactation. In the case of other adults the phosphorus allowances should be approximately 1.5 times those for calcium. In general, it is safe to assume that if the calcium and protein needs are met through common foods the phosphorus requirement also will be covered, because the common foods richest in calcium and protein are also the best sources of phosphorus.

Vitamin K. The requirement for vitamin K usually is satisfied by any good diet. Special consideration needs to be given to newborn infants. Physicians commonly give vitamin K either to the mother before delivery or to the infant immediately after birth.

Salt. The needs for salt and for water are closely interrelated. A liberal allowance of sodium chloride for the adult is 5 Gm. daily, except for some persons who sweat profusely. The average normal intake of salt is 10 to 15 Gm. daily, an amount which meets the salt requirements for a water intake up to 4 liters daily. When sweating is excessive, one additional gram of salt should be consumed for each liter of water in excess of 4 liters daily. With heavy work or in hot climates 20 to 30 Gm. daily may be consumed with meals and in drinking water. Even then, most persons do not need more salt than usually occurs in prepared foods. It has been shown that after acclimatization persons produce sweat that contains only about 0.5 Gm. to the liter in contrast with a content of 2 to 3 Gm. for sweat of the unacclimatized person. Consequently, after acclimatization, need for increase of salt beyond that of ordinary food disappears.

Water. A suitable allowance of water for adults is 2.5 liters daily in most instances. An ordinary standard for diverse persons is one milliliter for each calorie of food. Most of this quantity is contained in prepared foods. At work or in hot weather, requirements may reach 5 to 13 liters daily. Water should be allowed *ad libitum*, since sensations of thirst usually serve as adequate guides to intake except for infants and sick persons.

Typical Foods Allowed in the Treatment of Any Condition Requiring a Bland Diet

Cereal:

- Oatmeal
- Cream of Wheat
- Farina
- Breakfast Brownies
- Ralston
- Rice
- Corn flakes
- Puffed rice
- Puffed wheat
- Rice Krispies
- Rice flakes

Bread:

- White
- Graham

Egg:

- Soft-cooked
- Poached
- Soufflé
- Baked omelet

Cheese:

- Cottage cheese
- Soft cream cheese

Meat:

- Chicken
- Fish
- Lamb
- Liver
- Scraped beef
- Sweetbreads
- Oyster
- Bacon

Potato:

- Boiled
- Creamed
- Scalloped (with toast crumbs)
- Mashed
- Baked

Condiments:

- Salt

Vegetables:

- Carrot
- Squash
- Beet
- Pea
- Tender lettuce
- Spinach
- String bean
- Asparagus tips
- Cauliflower
- Strained tomato

Fruits—cooked without skins and seeds:

- Apple
- Prune
- Peach
- Pear
- Apricot
- White cherry
- Banana

Fruits—raw:

- Ripe banana
- Ripe pears
- Orange juice

Desserts:

- Gelatin, such as:
  - Bavarian cream made from juice of fruit listed above
- Ices and ice cream
- Puddings:
  - Rice
  - Tapioca
  - Prune whip
  - Graham whip
  - Blanc mange
  - Grape sponge
- Cake:
  - Sponge
  - Angel food
  - Hard sugar cookies

Beverages:

- Coffee substitutes:
  - Kaffee Hag
  - Sanka coffee
  - Postum
- Milk

Typical Foods Avoided in the Treatment of Any Condition Requiring a Bland Diet

- Coarse cereals and breads
- Coarse vegetables and fruits
- Concentrated acid fruits and vegetables
- Raw fruit and vegetables
- Pork, veal, salmon, sardine
- All fried or greasy foods
- Spices and condiments other than salt
- Coffee, strong tea

DIRECTIONS FOR SPECIAL PREPARATION AND COOKING OF VEGETABLES AND MEATS TO REDUCE THE POTASSIUM CONTENT

VEGETABLES

To Prepare Vegetables

1. Vegetables with skins—peel and cut into small pieces (about ¾ inch square, ⅛ inch thick).
2. Leaf vegetables—shred cabbage, spinach and other leaf vegetables.
3. Cauliflower—break into flowerets and partially quarter the floweret.
4. Brussels sprouts—cut in quarter sections.
5. String beans and asparagus—cut into pieces about ½ inch long.
6. Beets, corn and tomatoes—keep in a moistened parchment paper and cook for time as specified by table on page 714.

To Cook Vegetables

1. Cooking Utensil. Use a deep, narrow kettle.
2. Water. Use from six to eight times as much water as is ordinarily used in cooking vegetables (see table on page 714).
3. Salt. 1½ teaspoons of salt to each quart of water.
4. Cook uncovered. For time, see table on page 714.
5. Seasoning. When vegetables are done, drain and heat over a flame until dry, then season with salt and butter, cream or white sauce.

MEATS

To Prepare Meats

1. Sear the meat.
2. Cut meat into small pieces (about ½ inch square, ¼ inch thick).
3. Tie meat up in a moistened parchment paper.

To Cook Meats

To ½ cup cubed meat use
4 cups (1 quart) water and
2 teaspoons salt.

Cook just below the boiling point for two hours. Keep bag under water during entire cooking period by replacing any water lost by evaporation.

Serve meat with a white sauce, or in salads, sandwiches, omelets, croquettes, stews or meat pies.

TABLE FOR SPECIAL COOKING OF VEGETABLES TO REDUCE THE POTASSIUM CONTENT

Vegetable	*Amount*	*Water*	*Time*	*How Cooked*
	cup	*cups*	*minutes*	
1. Asparagus	1	8	10	Uncovered
2. Cabbage	1	8	10	Uncovered
3. Cauliflower	1	8	10	Uncovered
4. Spinach	1	8	10	Uncovered
5. Brussels sprouts	1	8	10	Uncovered
6. Broccoli	1	8	10	Uncovered
7. Onions	1	6	30–40	Uncovered
8. Peas	1	6	20–30	Uncovered
9. String beans	1	8	20–35	Covered
10. Carrots	1	6	Young, 25 Old, 30–40	Covered
11. Kohlrabi	1	6	30–40	Covered
12. Turnips	1	6	25–30	Covered
13. Parsnips	1	6	25–30	Covered
14. Rutabagas	1	6	25–30	Covered
15. Potatoes	1	6	15–25	Covered
16. Squash	1	6	20–30	Covered
17. Pumpkin	1	6	20–30	Covered
18. Beets	1	6	40	In parchment paper
19. Corn	1	6	30	In parchment paper
20. Tomatoes	1	6	30	In parchment paper

DIRECTIONS FOR THE PREPARATION OF A DRINK CONTAINING SALT

One quart will provide the amount of sodium and chloride usually prescribed per day in the treatment of Addison's disease.

	Gm.	*Approximate measure*
Beverage powder	90	½ cup
Sodium chloride (table salt)	10	2 teaspoons
Sodium citrate	5	1 teaspoon

Water to make 1 quart (1,000 cc.). Serve ice-cold.

AVERAGE POTASSIUM CONTENT OF FOODSTUFFS EXPRESSED IN GRAMS PER 100 GM.

Foodstuff	*Potassium Content*
Beverages:	
Apple cider	.095
Beer	.072
Champagne	.114
Coca-Cola	0
Coffee, beverage	.110
Coffee, roasted bean	1.651
Ginger ale	0
Grape juice	.106
Kaffee Hag, roasted bean	1.647
Postum	3.238
Red wines	.075
Sweet wines	.134
Malaga	.165
Sherry	.186
Bordeaux	.083
Tea, beverage	.030
Tea, dried leaves	1.689
White wines	.056
Bread and cereal products:	
Bread, white	.108
Bread, whole-wheat	.208
Bread, rye	.151
Corn flakes	.132
Corn meal, dry	.213
Cream of wheat, dry	.106
Farina, dry	.120
Flour, white	.115
Grapenuts	.342
Macaroni, dry	.130
Oatmeal, dry	.339
Puffed wheat	.117
Rice, polished, dry	.068
Rice, brown, dry	.561
Tapioca, dry	.039
Wheat bran	1.217
Concentrated sweets:	
Candy, sugar	.004
Corn sirup, white (Karo)	0
Honey	.386
Jelly made with fruit juice	.126
Maple sirup	.208
Molasses	1.349
Sugar, white	.004
Sugar, brown	.265
Condiments, etc.:	
Citron, preserved	.017
Coconut, dried	.544
Horse-radish	.445
Mustard	.761
Olives, green	
Olives, ripe	.003
Paprika	2.075
Pepper, black	1.140
Vinegar, cider	.165
Dairy products:	
Cheese (all kinds)	.187
Cream	.126
Eggs	.141
Yolk	.114
White	.155
Ice cream, commercial	.169
Milk, butter	.151
Milk, whole	.150
Fats:	
Bacon fat	0
Butter	.009
Margarine	.048
Mayonnaise	.007
Pork fat	.175

Foodstuff	*Potassium Content*	*Foodstuff*	*Potassium Content*
Meats and fish:		Cocoa	.940
Anchovy	.152	Cream of tartar	20.720
Bacon, raw	.160	Gelatin	0
Beef, corned	.117	Yeast, Brewer's, dried	2.055
Caviar	.422		
Clams, round	.131	Nuts (all kinds)	.577
Clams, soft, long	.212		
Cod, dried and salted	.031	Vegetables and fruits	
Crab, canned	.260	Vegetables in Group 1	.075
Fish, raw (all kinds)	.323	Vegetables in Group 2	.125
Lobster, canned	.258	Vegetables in Group 3	.200
Meat extracts	4.160	Vegetables in Group 4	.300
Meat, raw (all kinds)	.372	Vegetables in Group 5	.400
Oysters, large, raw	.145	Vegetables in Group 6	.500
Oysters, small, raw	.047	Fruits in Group 1	.075
Salmon, canned	.320	Fruits in Group 2	.125
Sardines, canned in oil	.433	Fruits in Group 3	.200
Shrimp, canned	.122	Fruits in Group 4	.300
		Fruits in Group 5	.400
Miscellaneous:		Fruits, dried (all kinds)	.888
Agar	.127	Dried beans	1.201
Baking powders, tartrate	9–12	Potato chips	.918
Baking powders, phosphate	0		

TABLE OF EQUIVALENTS

4 saltspoonfuls ...... = 1 teaspoonful
3 teaspoonfuls ...... = 1 tablespoonful
2 tablespoonfuls .... = 1 ounce
4 tablespoonfuls .... = ¼ cup
8 tablespoonfuls .... = ½ cup
16 tablespoonfuls (dry) = 1 cup
12 tablespoonfuls (liquid) .... = 1 cup
2 cups .... = 1 pint
4 cups .... = 1 quart
5 grams .... = 1 teaspoonful
15 grams .... = 1 tablespoonful
30 grams .... = 1 ounce
100 grams .... = ½ cup
250 grams .... = 1 cup
1 kilogram .... = 2.2 pounds

APPROXIMATE WEIGHTS AND MEASURES

1 gram (Gm.) .... = 1 cc.
1 teaspoon (tsp.) ..... = 5 cc.
1 tablespoon (tbsp.) .. = 15 cc.
1 ounce (oz.) fluid ... = 30 cc.
1 cup (dry) .... = 16 tbsp.
1 cup (liquid) .... = 12 tbsp.
1 cup .... = 240 cc.
1 pint (pt.) .... = 2 cups
1 quart (qt.) .... = 4 cups
1 quart (qt.) .... = 1,000 cc.
1 ounce (oz.) weight .. = 30 grams
1 pound (lb.) .... = 480 grams
2.2 pounds (lbs.) .... = 1 kilogram (Kg.)

TABLE OF EQUIVALENT CALCULATIONS

Grams of nitrogen .... × 6.25 = Grams of protein

Grams of protein .... × 0.165 = Grams of nitrogen

Grams of chloride .... × 1.65 = Grams of table salt

Grams of table salt .... × 0.6 = Grams of chloride

Grams of purin nitrogen .. × 3.0 = Grams of uric acid

Grams of uric acid .... × 0.33 = Grams of purin nitrogen

RECIPES

A few needed recipes referred to in some of the diets presented.

French Dressing

½ tsp. salt
¼ tsp. pepper
2 tbsp. vinegar (cider)
4 tbsp. olive oil

Mix ingredients and stir until well blended. A few drops of onion juice may be added.

100 Gm. contain approximately 85 Gm. of fat.

Mayonnaise Dressing

1 tsp. salt
cayenne
yolks 2 eggs
2 tbsp. lemon juice
2 tbsp. vinegar
1½ cups olive oil

Mix dry ingredients, add egg yolks, and when well mixed add ½ teaspoon vinegar. Add oil gradually drop by drop at first, and stir constantly. As mixture thickens, thin with vinegar or lemon juice. Add oil and acid alternately until all is used, stirring or beating constantly. If oil is added too rapidly, dressing will have a curdled appearance. A smooth consistency may be restored by taking the yolk of another egg and adding curdled mixture slowly to it. The work bowl in a larger bowl of crushed ice gives best results.

100 Gm. contain approximately 85 Gm. of fat.

Mineral Oil Dressing

If salad dressing without food value is desired, French or mayonnaise dressings may be made by using mineral oil in the place of other salad oils.

Baked Custard for the Diabetic

Egg	1	50 Gm.
Milk	1 glass	200 Gm.
Saccharine	½ grain	
Vanilla	4 drops	

This makes 2 custards. When one custard is used omit from the meal:

Fruit, 5%	½ cup	100 Gm.
Egg	1	50 Gm.

Jello without sugar may be purchased and prepared according to instructions on the package.

100 Gm. of jello without sugar contain 2 Gm. of protein.

Gelatin desserts may be made for the diabetic and ketogenic diets by the use of the fruits, fruit juices and cream allowed in the diet; ½ teaspoon gelatin is sufficient for 100 Gm. of fluid.

Corn Pone or Johnnycake

2 cups corn meal
2 tsp. salt
4 cups boiling water (about)
1 tbsp. shortening

Mix corn meal and salt; add boiling water, then shortening, and beat well. Spread ½ inch thick on a greased baking pan and bake in moderate oven until crisp (35 to 45 minutes).

Corn pone may be enriched by the addition of sugar or molasses.

Rice Biscuits (Rowe's Food Allergy)

2 cups rice flour
3 tsp. baking powder
2 tbsp. bacon fat or olive oil
½ tsp. salt
1 tbsp. sugar
1 cup water

Sift dry ingredients and mix in the bacon fat. Add water to make firm dough. Bake in a loaf pan in a rather hot oven.

Tapioca Pudding

2 halves peaches or pears (canned)
½ cup juice
½ cup cooked tapioca
2 tsp. sugar

Add sugar and fruit juice to tapioca; cook three minutes; add fruit, sliced. Chill and serve. (One cup or two servings.)

Bran Soy Muffins

Bran	⅓ cup	20 Gm.
Soybean meal	¼ cup	30 Gm.
Eggs	2	100 Gm.
Butter	6 squares (4 tablespoons)	60 Gm.
Baking powder	1 teaspoon	
Salt	½ teaspoon	
Water	½ cup	

Mix the dry ingredients. Add water, melted butter and well-beaten egg yolks. Beat the whites very stiff and fold them into the mixture. Oil 8 muffin tins. Divide batter evenly among the eight tins and bake in a moderate oven until brown.

One muffin: Carbohydrate, 1 Gm.; protein, 3 Gm.; fat, 9 Gm.

Soybean wafers may be secured from dietetic supply houses.

Lima-Bean-Flour and Potato-Flour Muffins

⅔ cup potato flour
½ cup Lima-bean flour
3 tsp. baking powder
½ tsp. salt
4 tsp. sugar
½ cup water
2 tbsp. shortening

Sift dry ingredients together. Melt fat and add to water; add slowly to dry ingredients. Put in greased muffin tins and bake at 400° F. for 20 minutes. Serve hot. Makes 10 small muffins.

Corn and Rice Muffins

1⅓ cups rice flour
⅔ cup corn meal
½ tbsp. sugar
¼ cup olive oil
½ tsp. salt
10 tsp. baking powder
1 cup water

Beat about three minutes. Put in small-sized muffin tins that are smoking hot and bake immediately in a quick oven (400° F.).

Lima-Bean-Flour and Potato-Flour Cookies

½ cup potato flour
½ cup Lima-bean flour
1 tsp. baking powder
Few grains salt
½ cup sugar
4 tbsp. shortening
½ tsp. nutmeg
¼ tsp. vanilla
2¼ tbsp. water

Cream together the fat and the sugar, sift the dry ingredients together three times, add to creamed mixture alternately with water; add vanilla, roll out on floured board (use potato flour) ¼ inch thick and cut with floured cookie cutter. Bake in oven at 428° F. for from 10 to 12 minutes. Makes 4 small cookies.

Lima-Bean-Flour and Potato-Flour Cup Cakes

6 tbsp. Lima-bean flour
¾ cup potato flour
5 tbsp. shortening
½ cup water
⅔ cup sugar
2½ tsp. baking powder
½ tsp. vanilla
½ tsp. lemon extract
Few grains salt
Few drops yellow coloring

Sift dry ingredients, cream fat and sugar, add dry ingredients and water alternately to creamed mixture. Add flavorings and coloring. Put in greased muffin tins and bake in oven at 430° for 30 minutes.

RECIPES USED IN ROWE'S ELIMINATION DIETS

The following recipes have been devised especially for the elimination diets. Satisfactory products have resulted from their use in many homes and diet kitchens.

Recipes for muffins, bread, cake and cookies have been revised according to experience. To ensure more uniform results, processed full fat soybean flours such as Staley's Soy Flour No. 1 (A. E. Staley Manufacturing Co., Decatur, Ill.), or Orangeblossom Soy Flour (Archer-Daniels-Midland Co., Minneapolis, Minn.) are advised. A flour made from the raw whole bean also may be used, but it is more bitter and molds more easily than the processed flour. Recommended measured amounts of the ingredients and the time and temperature for baking must be followed.

Measuring cups and spoons must be filled lightly and leveled off with a knife blade. Flour must not be packed or shaken into the cups.

Table of Abbreviations and Measurements

Tbsp. = tablespoonful
Tsp. = teaspoonful
Cup = cupful

16 tbsp. = 1 cup
8 tbsp. = ½ cup
8 oz. = 1 cup
3 tsp. = 1 tbsp.

IMPORTANT RECIPES FOR THE CEREAL-FREE ELIMINATION DIETS

(1) Fruit Tapioca

2½ cups canned fruit juice and water
4 tbsp. minute tapioca
½ cup sugar
¼ tsp. salt
1–1½ cups chopped or puréed apricots, pears, prunes or pineapple
1 tbsp. lemon juice

Combine fruit juice and water, minute tapioca, sugar and salt in a saucepan and mix well. Bring mixture to a boil, stirring constantly. Remove from fire. Do not overcook. Cool, stirring occasionally. Mixture thickens as it cools.

(2) Fruit-free Tapioca

3 cups water
⅓ cup minute tapioca
⅓ cup white sugar or
½ cup brown sugar
¼ tsp. salt
½ tsp. maple flavoring or 1 tsp. vanilla extract, or
2 tsp. caramel flavoring

(The amount of brown sugar and flavoring may be varied to suit individual taste.)

Combine all ingredients in a saucepan. Bring mixture quickly to a full boil over direct heat, stirring constantly. Remove from the fire. Do not overcook. Stir occasionally as it cools.

(3) Lamb Patties

Ground lamb pressed into small patties. Broiled or fried.

(4) Soy-potato Muffins or Bread

1¼ cups soy flour*
¾ cup potato starch flour
¼–⅓ cup soy oil
1 tsp. salt
2 tbsp. baking powder
1 tbsp. white sugar
1 tbsp. brown sugar
1 cup water

Sift the soy flour once before measuring. Fill the measuring cup lightly and level off the surface with a knife blade. Sift all the dry ingredients together four times. Add the oil and the water and beat well. Pour the batter into muffin pans which are well greased with soy oil. Bake in a moderate oven (350° to 375° F.) for 25 to 30 minutes. Makes 12 muffins.

For bread, use double amounts and bake in a deep small loaf pan at 350° F. for 1¼ hours.

If a moister texture is desired, decrease the potato starch flour to ¾ cup.

(5) Soy-corn or Soy-rice Muffins

Corn meal, cornstarch or rice flour may be substituted for potato starch flour if this is unavilable or if corn or rice products are included in the diet.

Muffins made with soy flour and corn meal are better if baked at 400° F. The amount of water required varies somewhat with combinations of soy flour and cornstarch, corn meal, potato starch or rice flour, but the mixture should be similar to cake batter in consistency. The texture can be changed with proportions of soy flour and starch: for a drier texture, increase the starch; for a moister one, decrease the starch to ¾ cup. Bacon fat or Mazola oil if corn is used may be substituted for soy oil.

(6) Soy-Lima-potato Muffins or Bread

¾ cup potato starch flour
1 cup soybean flour*
¼ cup Lima-bean flour
⅓ cup sesame or soy oil
2 tbsp. sugar
1 cup water†
6 tsp. baking powder
½ tsp. salt

Sift flour, baking powder and salt together three times. Blend the oil and sugar well. Add the sifted flour and the water alternately to the oil and the sugar. Beat well and pour into muffin pans which have been well greased with sesame or soy oil. Bake at 375° F. for 25 to 30 minutes. Makes 12 muffins. Or bake in a loaf pan at 350° to 375° F. for 1¼ hours.

* A full fat processed soybean flour is advised, such as Orangeblossom Soy Flour, made by Archer-Daniels-Midland Co., Minneapolis, Minn., or Soy Flour No. 1, made by A. E. Staley Manufacturing Co., Decatur, Ill.

† Or 1 cup cooked tapioca (2 tsp. tapioca cooked in 1 cup of water. Add water after cooking to make 1 cup).

(7) Soy-potato Pancakes or Waffles

To the recipe for muffins (4) add about ¼ cup of extra water to make a thinner batter. Bake on a griddle or waffle iron well greased with soy oil. Serve with maple sirup or sirup made with brown and white sugar flavored with maple or caramel.

(8) Lima Bean or Split Pea Soup

1 cup split peas or Lima beans
2 tbsp. bacon fat
Diced bacon, crisp
1 qt. water
Salt

Cook the split-peas or Lima beans to a smooth purée, and salt. Before serving, add bacon fat and crisp fried bacon.

(9) Tomato Soup (with Soybean Flour)

1 cup strained tomatoes or juice
1 cup water
2 tbsp. soybean flour
1 tsp. salt

Mix the soybean flour thoroughly with some of the water and add to the hot tomato juice and water. Boil for ½ hour. This resembles a cream soup in consistency and flavor.

(10) *Soy-potato Cup Cakes or Cake*

1 cup soy flour
¾ cup potato starch flour
5 tsp. baking powder
¾ cup sugar or ¼ cup brown and ½ cup white sugar
½ tsp. salt
½ cup soy oil
2 tsp. vanilla or 1 tsp. vanilla and 1 tsp. lemon extract
½ to ⅔ cup water

Sift soy flour once before measuring. Sift together all the dry ingredients four times. Mix the oil, sugar and flavoring and to this add the flour and water alternately, beginning and ending with flour. Beat well. Pour into muffin or layer-cake pans well greased with soy oil and bake at 375° F. for 30 minutes. Makes 12 cup cakes or 2 small layers. Or bake in a loaf pan for 45 to 50 minutes.

Variations: Flavor with lemon extract and grated lemon rind or with maple flavoring. Add chopped apricots, prunes or pineapple. Substitute fruit juice for water. Fondant slightly thinned with water or fruit juice may be used for frosting.

For fruit-free diets, eliminate lemon extract and all fruit and use vanilla extract or maple or caramel flavors.

(11) Soy-potato Cookies

Follow the recipe for soy-potato cake. Decrease the water to make a stiff dough. Force through a cookie press onto a cookie sheet well greased with soy oil. Or a thinner batter can be dropped from a teaspoon onto a greased cookie sheet. Bake at 375° to 400° F. for 10 or 15 minutes. A thicker dough can be rolled and kept in a refrigerator. Cut into thin slices and bake as desired. If kept in an airtight container, cookies will remain crisp.

(12) Soy-corn or Soy-rice Cup Cakes, Cake and Cookies

If potato starch is not obtainable, cornstarch or rice flour can be substituted in the soy-potato cake and cookie recipes. The amount of water required varies somewhat with kind of starch used. The texture should be that of cake batter. The texture will be drier if the starch is increased to 1 cup.

If cornstarch is used, Mazola oil can be substituted for soy oil, and confectioners' or powdered sugar containing 3 per cent cornstarch can be used for frosting.

(13) Soy Cracker*

1 cup soy flour
1 tsp. baking powder
¼ tsp. salt
2 tbsp. soy oil
1 tsp. sugar
⅓ cup water

Mix all ingredients well. Dough should be quite thin. Drop from a teaspoon onto a cookie sheet well greased with soy oil. Bake at 350° F. until dry and crisp. Sprinkle lightly with salt. These crackers will remain crisp if kept in a tightly covered container.

(14) Soy Cookies*

1 cup soy flour
2 tsp. baking powder
¼ tsp. salt
⅓ cup sugar
4 tbsp. soy oil
3 to 5 tbsp. water
½ tsp. vanilla or lemon extract

* These soy crackers and cookies are less desirable than those made with potato starch. If potato starch is not available and if allergy to rice and corn exists, pure soy products may be necessary for diet trial. They are also of value when high protein diets are desired.

Mix oil and sugar and add the flavoring. Sift soy flour once before measuring and sift twice more after adding baking powder and salt. Add flour to oil and sugar and sufficient water to make a stiff dough. Form into a roll and cut into cookies or force through a cookie press. With a softer dough, drop from a teaspoon onto a cookie sheet well greased with soy oil. Bake at 350° F. for 15 minutes. Chopped prunes or apricots may be added or fruit juice may be substituted for water. Cookies will remain crisp if stored in an airtight container.

(15) Soy-potato Pudding

4 level tbsp. soy flour
1 cup water
2 tsp. potato starch flour
3 tbsp. sugar
¼ tsp. salt
¼ tsp. lemon extract
¼ tsp. vanilla extract

Cook the soy flour and the water for 15 minutes in top of double boiler. Stir potato starch, sugar and salt into boiling mixture until it thickens. Continue cooking for 20 minutes. Flavor with lemon and vanilla extracts or with maple or caramel. May be served with fruit sauce, maple or caramel sirup if desired. More sugar may be desired or a combination of white and brown sugar may be used.

(NOTE: If potato starch flour is not available, 1½ tbsp. of granulated tapioca may be used. If corn or rice allergy is not probable, especially if tapioca is not available, 1 tbsp. of cornstarch or rice flour may be substituted for potato starch. *For fruit-free elimination diets,* ½ tsp. of vanilla extract with no lemon extract is necessary. Fruit sauce also must be omitted.)

(16) Caramel Frosting

⅔ cup water
2 cups brown sugar
3 tbsp. soy oil
1 tsp. vanilla extract

Combine sugar and water. Stir slowly while bringing it to a boil. Boil hard, stirring occasionally until the sirup has reached the "soft-ball" stage (234° F.). Remove from the fire, add soy oil and vanilla and allow to cool undisturbed until lukewarm. Beat the mixture until it gets thick and loses its luster. Spread quickly over the cake.

(17) Pineapple Filling

2 tbsp. potato starch flour
½ cup sugar
2 cups crushed pineapple—juice and fruit
1 tbsp. lemon juice

Mix flour and sugar, add pineapple and lemon juice and cook slowly until thick and clear. Cool slightly before spreading on cake. This may be used on top of the cake as well as for the filling. Apricots or peaches may be substituted for pineapple.

(18) Broiled Frosting

4 tbsp. soy oil
⅔ cup brown sugar
¼ cup water
½ tsp. vanilla
¾ cup finely chopped dried prunes or candied pineapple

Thoroughly combine all the ingredients and spread over warm cake. Brown lightly under the broiler.

(19) Fondant

2 cups sugar
¼ tsp. cream of tartar
1 cup boiling water
¼ tsp. salt
½ tsp. vanilla

Measure sugar and cream of tartar into a saucepan and add the boiling water. Stir over a low heat until sugar is dissolved. Do not let the candy boil until the sugar is dissolved and the sugar crystals are wiped down from the sides of the pan with a clean cloth. When the boiling point is reached, cover the kettle and boil vigorously for 5 minutes. Remove the cover, wipe off crystals from sides of the pan and continue cooking without stirring until the medium-ball stage has been reached (240° to 242° F.). When done, pour the candy at once into a cold wet platter and let it stand until lukewarm. Sprinkle salt over the surface, add vanilla and beat until white and knead in the hands until smooth and creamy. Put fondant into a glass jar and cover. It will keep several weeks in a cool place.

Use of Fondant: Put a portion of the fondant into the top part of a double boiler. Melt over hot but not boiling water until fondant softens. Coloring or flavoring is added at this stage. Lemon extract or lemon juice and grated lemon rind, unsalted Se-So Nuts (soaked soy beans browned in sesame oil), chopped prunes or glacéed pineapple may be used. Drop fondant from tip of a spoon onto waxed paper.

(20) Panocha

2 tbsp. sesame or soy oil
2 cups brown sugar
1 cup white sugar
1 cup water
⅛ tsp. soda

Heat the oil in a kettle, stir in sugars. Add water and soda and mix well with sugar. Wipe down sugar from sides of pan. Heat slowly to boiling, stirring until sugar is dissolved. Boil to 240° F., the medium-ball stage (the ball holds its shape when lifted from cold water). Remove from stove, sprinkle a dash of salt over top and set aside to cool undisturbed until lukewarm. Beat until creamy. Turn into greased pans and cut in squares.

(21) Marshmallows

2 cups sugar
¾ cup water
2 tbsp. gelatin
½ tsp. salt
1 tsp. vanilla extract

Mix sugar and water and boil until the soft-ball stage has been reached (234° to 238° F.). Remove from fire. Soften the gelatin in ½ cup of cold water. Pour the hot sirup over the softened gelatin and stir until dissolved. Allow to cool partially, add vanilla and salt and beat until the mixture is thick and white and will hold its shape. Pour into straight-sided pans. When firm, cut into squares. Roll in sugar or, if corn is allowed, powdered sugar may be used.

(22) Corn Pone

1 cup corn meal
½ tsp. salt
Boiling water
1 tbsp. Mazola oil

Carefully pour enough boiling water onto the corn meal to make a stiff mixture, stirring constantly. Add the oil and mix well. Mold into oblong pones and fry in hot skillet with enough fat to prevent sticking. When brown on one side, turn and brown on the other side. Serve hot.

(23) Corn-rice Muffins

1⅓ cups corn meal
⅔ cup rice flour
¼ cup sugar
½ tsp. salt
2½ tsp. baking powder
1 cup water
3 tbsp. Mazola oil

Sift all the dry ingredients together, add the water and the oil. Pour into well-greased muffin pans. Bake at 400° F. for 30 minutes.

(24) Corn-rye Muffins

Use the preceding recipe but substitute rye flour for rice flour.

(25) Rice Biscuit

Made by the Battle Creek Sanitarium.

(26) Rice Bread

1 cup rice flour
3 tsp. baking powder
2 tbsp. bacon fat or oil
1 tbsp. sugar
½ tsp. salt
¾ cup water

Sift the dry ingredients. Add water and fat. Bake in a loaf pan in a moderate oven, 350° to 375° F., for 45 to 50 minutes.

(27) Rye Bread

1½ cups rye flour
3 tsp. baking powder
½ tsp. salt
3 tbsp. specified oil
⅔ cup water (more if necessary)

Sift dry ingredients, add the oil and blend with pastry mixer. Add water and stir until smooth. Put in tin and allow to stand for 15 minutes. Bake 45 minutes in moderate oven (350° F.).

(28) Corn-rice Pancakes

⅔ cup rice flour
⅓ cup white corn meal
2 tsp. baking powder
2 tbsp. brown sugar
Salt
2 tbsp. sesame or Mazola oil
Water to make right consistency
1 tsp. caramel

Mix thoroughly and cook on a well-greased griddle.

(29) Pancakes or Waffles

1⅓ cups rice flour
½ cup cornstarch
1 tbsp. sugar
⅓ tsp. salt
3 tsp. baking powder
1¼ cup water
4 tbsp. specified oil

Sift dry ingredients, add water and oil, beat well with a rotary beater. Bake on a well-oiled griddle.

(30) Corn Crisps

1 cup corn meal
1 tsp. salt
1 tbsp. Mazola oil
1 tsp. sugar
2 cups boiling water

Mix all together. Pour a very thin layer on a well-greased cookie sheet. Bake 15 minutes at 350° F. While warm, cut into strips and sprinkle with salt.

(31) Rice Fruit Pudding

1½ cups cooked rice
¼ cup sugar
½ tsp. salt
1 cup canned apricots, peaches, pineapple or prunes and juice

Mix all ingredients together and bake in a moderate oven for 30 minutes. Serve warm with a pudding sauce.

(32) Rice Pudding with Lemon

1½ cups cooked rice
¼ cup sugar
½ tsp. salt
1 tbsp. lemon juice
2 tsp. grated lemon rind
Lemon sauce

Mix all ingredients together. Serve with additional lemon sauce.

(33) Rice Cup Cakes

⅔ cup hot water
1½ cups rice flour
2 level tbsp. of prescribed oil
¼ cup sugar
¼ tsp. salt
3 level tsp. baking powder
1 tsp. vanilla

Pour hot water over half the flour. Cream sugar and oil and add to the mixture, beating well. Add the other ingredients, mixing well. Bake in muffin pans about 20 minutes in a fairly hot oven (400° F.).

(34) Rice Cookies

3 cups rice flour
2 tsp. baking powder
1 cup sugar
½ cup of prescribed oil
1 lemon rind, grated
1 lemon—juice
¼ cup water

Sift dry ingredients, cream thoroughly with shortening. Add grated lemon rind and juice with just enough water to make a stiff dough and pat into shape. Sprinkle with sugar and bake in moderate oven for 5 to 7 minutes.

(35) Lemon Frosting

1 tbsp. grated lemon rind
Dash of salt
2 tbsp. sesame or soy oil
3 cups confectioners' sugar
2 tbsp. lemon juice
1 tbsp. water

Mix oil, salt and lemon rind. Add fruit juice and water alternately with sugar, stirring well after each addition. Place bowl over hot water a few minutes. Remove and spread over cake. This will cover a two-layer cake or 24 cup cakes.

(36) Rye Coffee Cake

2 cups rye flour
1 tbsp. specified oil
1 tbsp. baking powder
4 tsp. baking soda
¼ tsp. salt
½ cup water
½ cup apricot marmalade
3 tbsp. sugar

Sift all dry ingredients three or four times. Combine marmalade with water. Mix all well and bake in a medium oven.

(37) Puffed Rice Candy

1 cup sugar
⅓ cup brown sugar
1 cup water
¼ tsp. salt
1 tsp. vanilla
6 cups puffed rice

Cook sugar and water until brittle (254° F.). Add vanilla and salt. Pour over the puffed rice, stirring all the time so that the kernels will be evenly coated. Turn mixture into a greased pan and cut into squares. Keeps well in an airtight container.

MISCELLANEOUS RECIPES

(38) Pineapple-apricot Marmalade

4 cups apricot pulp—fruit cut in small pieces and packed solidly in the cup
1 cup crushed pineapple — juice and pulp
3½ cups sugar

Mix fruit and sugar and boil rapidly until thick—approximately 30 minutes. Seal in hot, sterile glasses.

(39) Cotlemade

1 quart apricots
1 quart lemons
Sugar
Water

Slice lemons, rind and all, very thin, discarding the seeds. Barely cover with water and cook gently 1 hour. Add the apricots, halved and pitted, and cook another hour, stirring occasionally. Measure the fruit and add an equal quantity of sugar. Boil rapidly, stirring frequently until the jelly stage is reached. Seal in sterile glasses. This marmalade is rather tart.

(40) Grapefruit Marmalade

3 large grapefruit
Water
Sugar

Cut the fruit very fine. Measure and cover with 2½ times as much water. Let stand overnight and the next morning boil briskly for 20 minutes. Remove from the fire and measure, adding 1 cup of sugar to each cup of fruit. Stir well until sugar is dissolved and let stand several hours. Boil briskly until it jells. Pour into hot sterile glasses and seal.

(41) Lemon Marmalade

Six lemons, unpeeled. Slice very thin and cut crosswise into small pieces. Measure fruit. Add three times as much water. Boil about 1 hour or until tender. Replace liquid boiled away with water. Allow ¾ cup sugar to each cup of fruit juice. Cook in 2-cup lots to the jelly test (thick, reluctant drops from the spoon—about 10 minutes). Pour into sterilized jelly glasses. Cover with paraffin. This makes eight 6-oz. glasses.

(42) Carrot Preserves

2 cups shredded carrots
1 cup sugar
2 tbsp. white vinegar
1 cup water

Boil all ingredients until carrots are tender and mixture thickens.

(43) Salad Suggestions

(*a*) Tomatoes stuffed with tiny green Lima beans which have been marinated in French dressing.

(*b*) Sliced marinated beets mixed with cold sliced tongue, shredded lettuce and French dressing.

(*c*) Cold artichoke served with oil, salt and lemon juice.

(*d*) Cut lemon or lime gelatin into ¾-inch cubes and serve with fruit salads or fruit cocktails.

(44) Molded Pear Salad

Dissolve a package of lemon gelatin in 2 cups of warm water. Pour one half into a pan and let stand. Fill cavity in each pear half with crushed pineapple, set upon chilled layer of gelatin and cover with remaining gelatin. Let set. Serve on lettuce with French dressing.

(45) Broiled Grapefruit

Cut grapefruit in halves, remove the center and cut around each section. Sprinkle teaspoonful of brown sugar over each half. Place under the broiler and broil for 10 to 12 minutes. Serve hot.

Sliced pineapple, apricots, peaches or prunes prepared in a similar way are attractive and delicious additions to broiled lamb chops, steak or chicken.

(46) Baked Pears

6 medium-sized pears
½ cup water
1 cup sugar, white or brown

Wash the pears and remove the blossom ends. Place in a baking dish, add sugar and water, cover and bake at 350° F. for 1 hour, or until pears are tender. Peaches may be baked in the same way, in which case select firm fruit and peel before baking.

(47) Lemon Ice

(Made in the Refrigerator)

⅔ cup sugar
2 cups water
1½ tsp. plain unflavored gelatin soaked in 3 tbsp. water
Pinch of salt
⅓ cup lemon juice
1 tsp. grated lemon rind

Cook sugar and water together 3 minutes. Dissolve soaked gelatin in the hot sirup. Add salt and lemon juice. Turn into the refrigerator tray and freeze until solid 1 inch from edge of tray. Scrape from the sides of the tray and transfer to a chilled bowl. Beat with a chilled rotary beater until fluffy and smooth. Return to tray and freeze again until firm.

(48) Apricot Ice

⅔ cup sugar
½ cup water
Pinch of salt
1½ tsp. gelatin soaked in 3 tbsp. water
1½ cups apricot nectar or puréed apricots and juice
2 tbsp. lemon juice
1 tsp. grated lemon rind, if desired

Follow directions above for Lemon Ice.

(49) Pineapple Ice

Substitute 1½ cups of canned, crushed, undrained pineapple in the recipe for Apricot Ice.

(50) Lemon Ice

(Using a Mechanical Freezer)

1 cup sugar
3 cups water
½ tsp. grated lemon rind
½ cup lemon juice

Boil sugar and water for 5 minutes. Remove from stove and cool. Add lemon juice and rind. Pour into the freezer can and freeze, using 6 or 8 parts of ice to 1 part of rock salt. This makes a little over 1 quart.

(51) Pineapple or Apricot Ice

1 cup sugar
3 cups water
1 tbsp. lemon juice
2 cups canned, crushed pineapple or apricot purée
¼ tsp. salt

Follow directions above for Lemon Ice using a mechanical freezer.

Note. Maple flavoring or caramel may be substituted if fruit is not allowed in the diet.

(52) Frappés

Frappés are water ices frozen to mush consistency and may have large crystals through them. Tomato juice, various combinations of fruit juice, or puréed fruits and juice can be used. They may be served as a dessert or beverage.

(53) Candied Fruit Peel

Remove the peel from lemons or grapefruit in lengthwise slices. Place in a saucepan, cover with cold water, add ¼ tsp. salt, heat slowly to boiling and boil gently until the peel is soft. Drain off the water. When peel is cool enough to handle, remove all the white fibrous portions, using a spoon to scrape it out. Cut rind in thin strips with sharp scissors.

(54) Glacé Fruit

2 cups sugar
¾ cup water
⅓ tsp. cream of tartar

Heat sugar and water slowly to boiling and add cream of tartar. After boiling point is reached, do not stir and keep the crystals wiped down from the sides of the pan. Boil to 300° F., or until sirup just starts to discolor. Remove pan at once from the heat, plunge it into a pan of cold water to stop the boiling, and then set the kettle in a pan of hot water.

The dipping should be done quickly. Have small pieces of well-drained pineapple, grapefruit sections, pitted prunes or thin slices of lemon ready, each one fastened on a skewer or toothpick. Dip each piece into the sirup. When well covered, remove and allow to cool on a platter well greased with an oil allowed in the diet. After cooling the skewer is removed.

(55) Lamb or Chicken Croquettes

1½ cups cooked chicken, chopped fine
½ tsp. salt
1 cup chicken broth (made at home)
3 tbsp. quick-cooking tapioca or 2 tbsp. cornstarch or tapioca flour

Cook the tapioca in the chicken broth for 6 minutes or until the tapioca is clear. Add the chicken and the salt. Chill and shape into croquettes. Roll in crushed corn flakes, rice flakes or crumbs of soybean bread. Fry in deep, prescribed oil or bake in the oven for 30 to 45 minutes.

(56) Cornstarch Fruit Blanc Mange

1½ cups fruit pulp and juice
1½ cups water
4 tbsp. cornstarch
3 tbsp. sugar

Dissolve cornstarch in a little water. Heat the fruit pulp, water and sugar. When almost boiling, add the cornstarch mixed in water. Continue cooking for 15 or 20 minutes in a double boiler. Pour into molds and chill. Serve with fruit or pudding sauce.

(57) Clear Pudding Sauce

½ cup sugar
1 tbsp. cornstarch, tapioca flour or tapioca
⅛ tsp. salt
1 cup boiling water
1 tsp. vanilla or lemon extract

Measure sugar, cornstarch (or tapioca flour) and salt into a saucepan. Mix well. Add boiling water slowly, stirring carefully to make a smooth sauce. Heat to boiling, stirring constantly until thickened, smooth and clear. Add vanilla or lemon extract and serve hot.

GENERAL INFORMATION REGARDING RALSTON DIET

This diet is for use in determining the specific food or foods to which a patient may be sensitive. Though it is limited to foods to which few persons are sensitive, the Day's Meal-Planning Guide and the Recipes enable a patient to have a variety of appetizing meals. When the directions in the Guide are carefully followed and generous servings are eaten, the day's diet provides the approximate amounts of calories, protein, minerals (except calcium) and vitamins (except thiamine) recommended for average adults by the Food and Nutrition Board of the National Research Council.

At the end of several days, by which time symptoms can be expected to clear up if due to the eliminated foods, other foods are added one at a time at reasonable intervals to determine the offending food or foods. If the patient must remain on the Restricted Diet for an extended period, or if the added foods do not supply generous amounts of calcium and thiamine, the physician will doubtless wish to supplement the diet with thiamine and with calcium compounds until the patient can get these needed nutrients from food.

When *rice is the suspected allergen,* the physician may wish to substitute barley for the rice. Barley flour may be substituted for the rice flour in all recipes given, except the Rice Griddle Cakes and Waffles.

* * *

To help the patient obtain foods that may not be easy to buy in some areas, the physician may wish to pass along the following information:

Rice Flour: If not available in local grocery or dietetic and health food stores, the following concerns will sell by mail or give addresses of local sources: Chicago Dietetic Supply House, 1748–52 W. Van Buren Street, Chicago 12, Illinois; River Brand Rice Mills, Inc., 11 Beach Street, New York 13, New York.

APRICOTS, CHERRIES, PEACHES: *Commercially Canned*—The diet has been limited to those marked "Water-packed" or "Unsweetened" because frequently corn sirup and/or corn sugar (dextrose) are used in those packed in sirup. Neither is used in Del Monte fruits packed in sirup, so these may be included in the diet. Any other brand may be included if one can be sure from the information on the label that corn sirup and/or corn sugar (dextrose) were not used.

Cranberries: *Commercially Canned*—Sweetened cranberry sauce, jelly and juice are listed in diet because processors of these fruits certify that corn sirup or corn sugar is never used.

Lamb: Swift & Company's "Meats for Juniors" include a 5-oz. can of cubed lamb to which only salt is added. It is now available in food stores in some cities and the producers anticipate eventual wide distribution. Marshall Field & Co., Chicago, Illinois, and Hearn's Department Store, 5th Avenue and 14th Street, New York, will sell it by mail.

Vegetables: *Commercially Canned*—The labels of some canned vegetables do not always specify the food products that may have been added for seasoning or flavoring. This necessarily limits their use in the diet.

Spinach—Only salt and water are customarily added, therefore commercially canned spinach is listed in the diet.

Beets—"Baby," "Junior," Libby and Del Monte brands have only salt and water added. These and any other brand, the label of which *states* that nothing was added or that only salt and water were added, may be used.

Sweet Potatoes—Any marked "dry pack" may be used. Those packed in sirup may contain corn sirup and/or corn sugar (dextrose). Del Monte brand does not, therefore may be used. Any other brand may be used if one can be sure from the information on the label that corn sirup and/or corn sugar (dextrose) were not used.

Of course, if it has been established that corn and corn products do not contain the offending allergens, such rigid exclusion of corn sirup and corn sugar need not be practiced. *Nov. 1946.*

RECIPES USED IN RALSTON'S ELIMINATION DIET

In preparing, cooking and serving foods in this diet be sure they do not come in contact with any food not in the diet or with utensils and dishes that have not been washed since contact with any food not in the diet.

Lamb Stew

½ lb. lamb, cut for stew
1 tbsp. rice flour
¾ tsp. salt
1 tbsp. lamb drippings
1¼ cups boiling water
1½ cups diced, pared sweet potatoes

Roll lamb in mixture of flour and salt. Brown in hot drippings. Add water. Cover; simmer 1 hour. Add potatoes; cover and cook 25 minutes longer or until tender. 3 servings.

Lamb Pilaf

1 tbsp. lamb drippings
1½ tbsp. rice flour
1 cup hot water
½ tsp. salt
1 cup cooked rice (wild, brown or white)
1 cup cooked, finely diced lamb

Melt drippings in saucepan. Blend in flour, stirring until brown. Stir in water and salt. Boil 2 minutes. Add rice and lamb; heat thoroughly. 3 servings.

Braised Lamb Shank

2 lamb shanks
½ tsp. salt
2 tbsp. hot lamb drippings
¾ cup hot water
2 tbsp. rice flour
2 tbsp. cold water

Sprinkle meat with salt. In heavy pan with tight-fitting cover, brown meat in drippings. Add hot water. Cover; simmer 1 hour or until tender, adding water if necessary. Remove meat to hot platter. Mix flour and water until smooth; add to liquid in pan, stirring until thickened. 2 servings.

Lamb Patties

Only pure lamb patties or those mixed with cooked rice or Ry-Krisp crumbs can be used. Dealer-prepared patties frequently contain wheat products, dried eggs or milk.

Lamb Loaf

1 lb. twice ground lamb
1 tsp. salt
¼ cup water
1 cup grated raw sweet potato
¼ cup Ry-Krisp crumbs

Mix together all ingredients. Shape into loaf; put into pan greased with lamb drippings. Bake in 325° F. oven 1 hour. serve hot or cold. 4 servings.

Lamb Liver Slices

Place 4 thin slices liver (½ lb.) in pan; cover with boiling water. Cover; let stand 12 minutes. Drain. Melt 1 tablespoon lamb drippings in skillet. Add liver; cook 1 minute on each side. Sprinkle with ½ teaspoon salt. 2 servings.

Beets—Harvard

2 tbsp. sugar
¼ tsp. salt
1 tbsp. rice flour
½ tsp. citric acid crystals
½ cup beet liquid or water
1 cup hot, cooked beets, sliced or diced

Mix dry ingredients. Stir in water. Cook while stirring 2 minutes, or until thickened. Add beets; heat thoroughly. 2 servings.

Pickled: Omit rice flour in above recipe; increase citric acid to 1 teaspoon. Mix dry and liquid ingredients; pour over beets. Chill. 2 servings.

Sweet Potatoes—Glazed

Put whole or split cooked, pared potatoes in saucepan. For each medium-sized potato add 1 tablespoon lamb drippings, 2 tablespoons sugar. Cook over low heat, turning frequently, until thoroughly heated and coated with sugar mixture.

Sweet-potato Balls

Mash cooked potatoes with lamb drippings and salt to taste. Shape into balls. Roll in Ry-Krisp crumbs. Put in shallow baking dish greased with lamb drippings. Heat thoroughly in 375° F. oven.

Rice Griddle Cakes

1 cup sifted rice flour
½ tsp. salt
¾ tsp. baking soda
1½ tsp. cream of tartar
1 tbsp. sugar
¾ cup water
¼ cup melted lamb drippings

Resift flour with dry ingredients. Stir in water and drippings quickly but thoroughly. Bake on hot, ungreased griddle. Ten 4-inch cakes. Serve with a Sugar Sirup or a Sweet Spread (see recipes).

Rice Waffles: Pour about ½ cup of above batter into hot waffle iron, close quickly and bake until brown. Three 7-inch waffles.

Rice Cooked with Dried Fruit

¼ tsp. salt
2½ cups boiling water
¼ cup white rice*
¼ cup cut-up dried apricots, peaches or pitted prunes
Sugar to taste

Add salt to boiling water; stir in rice slowly. Cook over low heat 15 minutes. Add fruit; cook 15 minutes longer, stirring frequently. Add sugar. 2 servings.

Rice Cookies

1 cup sifted rice flour
¼ tsp. baking soda
1 tsp. cream of tartar
¼ tsp. salt
¼ cup lamb drippings
1 tsp. vanilla
½ cup sugar
¼ cup water

Resift flour with soda, cream of tartar and salt. Put drippings and vanilla into bowl; mix in sugar gradually. Add flour alternately with water. Mix well. Drop by teaspoons onto baking sheet greased with lamb drippings. Bake in 400° F. oven 12 minutes or until brown. 2½ dozen.

Ry-Krisp—Toasted

Brush tops of 12 Ry-Krisp wafers with 2 tablespoons melted lamb drippings. Bake in 400° F. oven 10 minutes. Serve warm or cold. 4 servings.

Sugar-Toasted: Brush with drippings as above. Sprinkle with sugar, using about ¼ cup. Bake as above.

Tapioca Pudding—Basic

1 cup boiling water
2½ tbsp. quick-cooking tapioca
¼ cup sugar
⅛ tsp. salt
½ tsp. vanilla

Stir water slowly into tapioca. Add sugar and salt. Cook over boiling water 12 minutes or until clear, stirring frequently. Cool. Add vanilla. Chill. 2 servings.

Peach: Before chilling the above, add ½ cup drained cooked, fresh or dried cut-up peaches.

Caramel: In Basic Recipe decrease boiling water to ¾ cup; replace sugar with ¼ cup Caramel Sugar Sirup (see recipe); omit vanilla.

* Brown rice can be used if water is increased to 4 cups and the mixture cooked 30 minutes before adding fruit.

Fruited Gelatin

¾ cup dried fruit*
3¼ cups water
1 tbsp. unflavored gelatin
¼ cup cold water
¼ tsp. citric acid crystals
⅛ tsp. salt
⅔ cup sugar

Cook fruit in 3¼ cups water for 30 minutes or until tender. Drain, saving juice; add water to make 1¾ cups. Soften gelatin in the ¼ cup cold water. Heat juice, citric acid, salt and sugar to boiling. Add gelatin, stirring until dissolved. Chill. When beginning to thicken, cut up fruit and add. Rinse mold with water; pour in gelatin mixture. Chill until firm. 4 servings.

Fruit Betty

6 Ry-Krisp wafers
1 cup cooked dried fruit,* drained and cut up
¼ tsp. citric acid crystals
⅛ tsp. salt
½ cup fruit juice†
1 tbsp. sugar

Grease baking dish with lamb drippings. Crumble wafers. Arrange in baking dish layers of fruit and crumbs: fruit on bottom, crumbs on top. Stir citric acid and salt into juice and pour over fruit and crumbs. Sprinkle with sugar. Bake in 375° F. oven 30 minutes. Serve warm or cold. Two or 3 servings.

Sugar Sirups

Plain: Boil together for 5 minutes equal parts of sugar and water.

Caramel: Sprinkle ¼ cup sugar into small skillet over low heat. Stir until sugar melts and turns golden brown. Add ¾ cup sugar and 1 cup boiling water. Cook until smooth, stirring constantly. Boil 10 minutes longer without stirring. ¾ cup.

Salad Dressing

Basic
2 tbsp. rice flour
½ tsp. salt
2 tbsp. sugar
1 tsp. citric acid crystals
½ cup water
½ cup olive oil or mineral oil
¼ cup Caramel Sugar Sirup (see recipe)

Mix together dry ingredients. Stir in water. Cook while stirring over low heat 2 minutes, or until thickened. Cool. With rotary beater, beat in oil a tablespoon at a time. Beat in sirup. 1 cup.

Olive: Add ¼ cup finely cut ripe olives to above Basic Dressing. Serve on Spinach or Sweet Potato Salad.

Cranberry: Add ¼ cup cranberry juice to above Basic Dressing. Serve on Spinach Salad.

* Dried apricots, peaches, pitted prunes or a mixture of these can be used. Two cups fresh sliced peaches can be used if the cooking time is decreased to 15 minutes.

† *For fruit and juice,* cook ⅔ cup dried fruit in 1¼ cups water until tender. To apricots add ½ cup sugar; to prunes or peaches, ⅓ cup sugar. Cook 5 minutes longer.

Salads

Beet: Cut up ½ cup cold cooked beets. Pour over them 2 tablespoons Basic Dressing. Sprinkle with 2 tablespoons Ry-Krisp crumbs.

Spinach: Pack ½ cup cooked, chopped spinach in a cup. Chill; turn out; pour over it 2 tablespoons Basic, Olive or Cranberry Dressing. Sprinkle with 2 tablespoons Ry-Krisp crumbs.

Sweet Potato: Cut up ½ cup cold cooked sweet potatoes. Pour over them 2 tablespooss Basic or Olive Dressing. Sprinkle with 2 tablespoons Ry-Krisp crumbs.

Apricot Juice

To 8 cups boiling water add 1 cup dried apricots. Cook 45 minutes, stirring occasionally. Save juice; push apricots through coarse sieve. Stir ½ cup sugar, 1 teaspoon citric acid crystals and apricot juice into apricot pulp. Chill. Thin with water as desired. 1 quart.

Thickened Prune Juice

Slowly add 1 cup prune juice to 1 tablespoon rice flour. Cook slowly until thickened, stirring.

Sweet Spreads

Measure pitted and crushed fresh apricots, cherries, peaches or cranberries singly or in combination. Add an equal quantity of sugar. Cook gently until thick, stirring occasionally to prevent sticking. Pour into hot sterile jars and seal unless to be used immediately.

Cut-up cooked sweetened dried fruits also make an acceptable spread.

Marshmallows

2 tbsp. unflavored gelatin
½ cup cold water
2 cups sugar
¾ cup boiling water
½ tsp. salt
½ tsp. vanilla
⅓ cup sugar

Soften gelatin in cold water. Dissolve the 2 cups sugar in the boiling water. Without stirring, boil to 260° F. or until sirup spins a thread when dropped from edge of spoon. Keep crystals wiped down from sides of pan. Remove from heat. Add gelatin; stir quickly only until dissolved. Let stand until partially cooled. Add salt and vanilla. Beat until thick, fluffy and white. Spread bottom of 8-inch square pan with ⅓ cup sugar. Pour mixture into pan; let stand in cool place (not a refrigerator) until thoroughly cold. With a wet, sharp knife loosen around edges of pan; turn out on board lightly covered with more sugar. Cut into squares; roll in sugar left on board. 36 pieces.

Panocha

2 tbsp. lamb drippings or mineral oil
2 cups brown sugar
1 cup granulated sugar
1 cup water
⅛ tsp. baking soda
¼ tsp. salt

Mix together oil, sugars, water and soda. Heat slowly to boiling, stirring until sugar is dissolved. If necessary, wipe down crystals from sides of pan. Boil to 240° F. (the ball holds its shape when liften from cold water). Remove from heat, sprinkle salt over top; cool to lukewarm. Beat until mixture holds its shape. Turn into 8-inch square pan greased with an allowed fat and cut into squares when cool. 36 pieces.

BREWER'S YEAST

The contents of two tablespoonfuls (30 Gm.) of Brewer's Yeast are:

Protein	12.2 Gm.
Carbohydrate	13. Gm.
Fat	.3 Gm.
Thiamine	4.5 mg.
Riboflavin	2.5 mg.
Niacin	10. mg.
Ash	1.4
Moisture	1.4
Calories	105

MUCIN MIXTURE*

¾ cup mucin—90 Gm.
1 cup water
3 cups milk
3 cups cream
1 tsp. vanilla
¼ tsp. salt
½ cup chocolate sauce

METHOD:

Add the water rapidly to the mucin, stirring with a very strong egg beater. Beat out all the lumps, then add the milk, cream, salt, vanilla and chocolate sauce.

The chocolate sauce or vanilla may be omitted if the patient does not care for them.

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* This recipe for mucin mixture has been used with much success by the dietetic department of Passavant Memorial Hospital.

URINE TESTS

To Test for Diacetic Acid

To about 10 cc. of the fresh urine carefully add a few drops of an undiluted aqueous solution of ferric chloride, liquor ferri chloridi, U.S.P. A precipitate of ferric phosphate first forms, but upon the addition of a few more drops is dissolved. The depth of the Burgundy-red color obtained is an index of the quantity of diacetic acid present.

Confusion as to the significance of the test arises if the patient is taking sodium salicylate, aspirin, antipyrine, cyanates or acetates. This is avoided to a considerable extent by vigorously boiling the urine after the addition of the ferric chloride, when the deep color markedly decreases or disappears if caused by diacetic acid, but remains the same if caused by the foregoing drugs.

To Test for Acetone

The different tests for acetone are in reality tests for diacetic acid. Legal's test is as follows: Dissolve a few crystals of sodium nitroprusside in 5 cc. of urine, which is then rendered alkaline with sodium hydrate. Shake vigorously. Then allow two drops of glacial acetic acid to run down the side of the test tube, when the mixture turns a distinct purple color.

To Determine Whether the pH of the Urine is 5.5 or Less

To determine whether the pH of the urine is 5.5 or less, as required for the bactericidal action of beta-oxybutyric acid, proceed as follows: Soak filter paper of good grade in an aqueous solution of chlorphenol red, of a concentration of 0.04 per cent, and then dry. This serves as a test paper. It is yellow when dry. If it turns red when dipped in the urine, the pH of the urine is above 5.5. Therefore, to determine whether the pH of the urine is less than 5.5, it is necessary to see whether such paper when wet with the urine retains its yellow color.

To Determine Whether a Ketonurine Contains Sufficient Beta-oxybutyric Acid

To determine whether a ketonurine contains sufficient beta-oxybutyric acid to be bactericidal (0.5 per cent or more), the method of Osterberg and Helmholz is used. This gives the concentration of beta-oxybutyric acid indirectly over a fairly wide range of ketosis between the concentration of aceto-acetic acid and that of beta-oxybutyric acid in ketonurine.

The test based on the Rothera (nitroprusside) reaction is performed as follows: To 800 mg. of ammonium sulfate in a long glass tube graduated at 50 cc. (Nessler comparison tube) are added 3 drops of concentrated ammonium hydroxide (0.15 cc.) and 1 cc. of the urine to be examined. The mixture is allowed to stand 6 minutes at a room temperature of approximately 20° C. The reaction product is then quickly diluted with water to the 50-cc. mark, mixed and immediately compared with the standard. The standard is prepared by adding 4.0 cc. of a solution containing two parts of 0.04 per cent solution of phenol red and 1.4 parts of 0.04 solution of bromthymol blue to 46 cc. of phosphate buffer at pH 8.0. This develops a stable color identical to that produced by ketonurine which contains 0.5 per cent beta-oxybutyric acid treated with sodium nitroprusside. If the color of the unknown is deeper than that of the standard, the concentration of beta-oxybutyric acid is more than 0.5 per cent. If the color is lighter, the reverse is true.

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